Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur 440033

Scheme and Syllabus for

Bachelor of Technology (Civil Engineering)

Submitted by

Board of Studies in Civil Engineering

FYUG Engineering Curriculum: NEP-Civil Engineering

(Dr. N. R. Dhamge) Dr. K. R. Dabhekar Dr. R. G. Bade Dr. S. S. Shirkhedkar (Dr. [illegible]) Dr. M. G. Pathan (Dr [illegible] Kadam) 03/4/25

Vision:
To create professionally competent engineers, researchers and entrepreneurs in the field of civil engineering for the benefit of society

Mission:
- To impart quality engineering education as per the industry need
- To motivate students to undertake innovation and research on next generation technologies
- To create an environment that shall foster growth of professionals capable of effectively using the scientific and technical knowledge for the betterment of mankind

Program Educational Objectives (PEOs):
I. Graduates will have the ability to apply engineering knowledge and skills to provide solutions to real world technical problems.
II. Graduates will be successful as engineering professionals, innovators or entrepreneurs with a multidisciplinary approach contributing towards research and technological developments.
III. Graduates will have the ability to pursue higher education in Civil Engineering and allied streams.
IV. Graduates will function in their profession with social awareness and responsibility while maintaining ethical standards.

PROGRAM OUTCOMES (POs)
As per AICTE Exam Reform Manual

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

PO2: Problem analysis: Identify, formulate and analyze hardware and software engineering problems and arrive at substantiated conclusions using first principles of mathematics, natural and engineering sciences.

PO3. Design/Development of solutions: Design and develop hardware / software system to meet desired needs within realistic constraints related to economic, environmental, social, political, ethical, health and safety, verifiability, and sustainability concerns.

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

PO5. Modern tool usage: Use techniques, skills, and modern computer engineering tools, including simulation and modeling, for addressing the needs of engineering profession and interdisciplinary business.

PO6. The engineer and society: Understand the computing needs of inter-disciplinary scientific and engineering disciplines and design and develop algorithms and

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techniques for societal, health, safety, legal and cultural problems.

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

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

PO9. Individual and team work: Function as member or leader of team and to understand engineering management principles & finance to manage projects in multidisciplinary environment.

PO10. Communications:Effectively transfer technology to engineering community and society at large on broadly defined engineering needs through technical reports, presentations and software technologies.

PO11. Project management and finance:Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

PO12. Life-long learning: Engage in lifelong learning and adapt to rapid changes in computer science & allied areas.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Graduates will demonstrate the knowledge of engineering for sustainable development and socio economic growth of society

PSO2: Graduates will impart multidisciplinary knowledge and entrepreneurship skills for identifying career goals and innovation in construction materials and practices

CREDIT FRAMEWORK STRUCTURE

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	3 * 2 =6	4 * 2 =8	--	--	--	--	--	--	14
Engineering Science Course		4 * 2 =8	04	--	--	--	--	--	--	12
Programme Core Course (PCC)	Program Courses	--	02	4 * 2 =8	4 * 2 =8	4 * 2 +2 =10	3+3+3 =9	0	4+4=8	44
Programme Elective Course (PEC)		--	--	--	--	04	4 +3 =7	02	3 * 2 =6	20
Multidisciplinary Minor (MDM)	Multidisciplinary Courses	--	--	02	02	04	02	02	02	14
Open Elective (OE) Other than a particular program		--	--	04	02	02	--	--	--	08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	02	02	--	02	--	02	--	--	08
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science and Management (HSSM)	02	--	--	02	--	--	--	--	04
Entrepreneurship/ Economics/ Management Courses		--	--	02	02	--	--	--	--	04
Indian Knowledge System (IKS)		--	02	--	--	--	--	--	--	02
Value Education Course (VEC)		--	--	02	02	--	--	--	--	04
Research Methodology	Experiential Learning Courses	--	--	--	--	--	--	04	--	04
Comm. Engg. Project(CEP)/ Field Project (FP)		--	--	02	--	--	--	--	--	02
Project		--	--	--	--	--	--	--	04	04
Internship/OJT		--	--	--	--	--	--	12	--	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02	--	--	--	--	--	--	04
Total Credits (Major)		**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**160**

B.Tech. Semester-I (Civil Engineering-Major)

S N	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	BSC - I	BCV1T01	Matrices & Differential Calculus	ASH	3	-	-	3	3	70	30	45	-	-	-
2	BSC – II	BCV1T02	Applied Physics	ASH	2	-	-	2	3	70	30	45	-	-	-
3	BSC – II	BCV1P02	Applied Physics Lab	ASH	-	-	2	1	-	-	-		25	25	25
4	ESC – I	BCV1T03	Engineering Graphics for Civil	Civil	3	-	-	3	3	70	30	45	-	-	-
5	ESC – I	BCV1P03	Engineering Graphics for Civil Lab	Civil	-	-	2	1	-	-	-	-	-	50	25
6	ESC – II	BCV1T04	Fundamentals of Vastushastra	Civil	3	-	-	3	3	70	30	45	-	-	-
7	ESC – II	BCV1P04	Fundamentals of Vastushastra Lab	Civil	-	-	2	1	-	-	-	-	25	25	25
8	AEC-I	BAE1T01	Communication Skills	ASH	1	0	0	1	2	35	15	23			
9	AEC-I	BAE1P01	Communication Skills Lab	ASH	0	0	2	1	--	--	--	--	25	25	25
10	VSC - I	BVS1P01	Construction Workshop Practices Lab	Civil	-	-	4	2	-	-	-	-	50	50	50
11	CC – I	BCC1P01	Refer CC Basket	ASH	-	-	4	2	-	-	-	-	-	100	50
			Total		**12**	**-**	**16**	**20**		**315**	**135**		**125**	**275**	

Dr. K.R. Dabhekar

Dr. Ranjeet Patil

B.Tech. Sem-II (Civil Engineering-Major)

S N	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	BSC–III	BCV2T05	Numerical Methods	ASH	3	-	-	3	3	70	30	45	-	-	-
2	BSC–III	BCV2P05	Numerical Methods Lab	ASH		-	2	1	-	-	-	-	25	25	25
3	BSC–IV	BCV2T06	Applied Chemistry	ASH	3	-	-	3	3	70	30	45	-	-	-
4	BSC–IV	BCV2P06	Applied Chemistry Lab	ASH			2	1	-	-	-	-	-	50	25
5	ESC– III	BCV2T07	Engineering Mechanics	Civil	3	-	-	3	3	70	30	45	-	-	-
6	ESC– III	BCV2P07	Engineering Mechanics Lab	Civil			2	1	-	-	-	-	25	25	25
7	PCC – I	BCV2T08	Building Construction Materials and Practices	Civil	2	-	-	2	3	70	30	45	-	-	-
8	IKS–I	BIK2T01	Refer IKS Basket	ASH	2	-	-	2	3	70	30	45	-	-	-
9	SEC - I	BSE2P01	Refer SEC Basket	ASH	-	-	4	2	-	-	-	-	50	50	50
10	CC– II	BCC2P02	Refer CC Basket	ASH	-	-	4	2	-	-	-	-	-	100	50
			Total		**13**	**-**	**14**	**20**		**350**	**150**		**100**	**250**	

Exit option: Award of UG Certificate in Major with 40 credits and an additional 8 credits in skill-based courses, internship, mini projects etc.

B.Tech. Sem – III (Civil Engineering-Major)

SN	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	PCC-II	BCV3T09	Strength of Materials	Civil	3	-	-	3	3	70	30	45	-	-	-
2	PCC-II	BCV3P09	Strength of Materials Lab	Civil	-	-	2	1	-	-	-	-		50	25
3	PCC-III	BCV3T10	Concrete Technology	Civil	3	-	-	3	3	70	30	45	-	-	-
4	PCC-III	BCV3P10	Concrete Technology Lab	Civil	-	-	2	1	-	-	-	-	25	25	25
5	MDM-I	BMD3T11	Computer Programming by Python	Civil	2	-	-	2	3	70	30	45	-	-	-
6	OE-I	BOE3T01	Open Elective – I Refer OE Basket	Civil	3	-	-	3	3	70	30	45	-	-	-
7	OE-I	BOE3P01	Open Elective – I Lab Refer OE Basket	Civil	-	-	2	1	-	-	-	-	25	25	25
8	HSSM-I	BHM3T01	Entrepreneurship in Civil Engineering	Civil	2	-	-	2	3	70	30	45	-	-	-
9	VEC-I	BVE3T01	Constitution of India	ASH	2	-	-	2	3	70	30	45	-	-	-
10	CEP	BCE3P01	Community Project/Mini Project	Civil	-	-	4	2	-	-	-	-	50	50	50
			Total		**15**	**-**	**10**	**20**		**420**	**180**		**100**	**150**	

B. Tech. Sem-IV (Civil Engineering-Major)

SN	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	PCC-IV	BCV4T12	Structural Analysis	Civil	3	-	-	3	3	70	30	45	-	-	-
2	PCC-IV	BCV4P12	Structural Analysis Lab	Civil	-	-	2	1	-	-	-	-	-	50	25
3	PCC-V	BCV4T13	Geotechnical Engineering	Civil	3	-	-	3	3	70	30	45	-	-	-
4	PCC-V	BCV4P13	Geotechnical Engineering Lab	Civil	-	-	2	1	-	-	-	-	25	25	25
5	MDM-II	BMD4T14	Artificial Neural Networks	Civil	2	-	-	2	3	70	30	45	-	-	-
6	OE-II	BOE4T02	Open Elective – II Refer OE Basket		2	-	-	2	3	70	30	45	-	-	-
7	AEC-II	BAE4T02	Civil Engineering Report Writing	Civil	2	-	-	2	3	70	30	45	-	-	-
8	HSSM-II	BHM4T02	Construction Planning And Management	Civil	2	-	-	2	3	70	30	45	-	-	-
9	VEC-II	BVE4T02	Environmental Science	Civil	2	-	-	2	3	70	30	45	-	-	-
10	VSC-II	BVS4P02	Building Design and Drawing Lab	Civil	-	-	4	2	-	-	-	-	50	50	50
			Total		**16**	**-**	**08**	**20**		**490**	**210**		**75**	**125**	

Exit option: Award of UG Diploma in Major and Minor with 80 Credits and an additional 8 credits in skill-based courses, internship, mini projects etc.

B. Tech. Sem-V (Civil Engineering-Major)

SN	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		ExamHrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	PCC-VI	BCV5T15	Design of Reinforced Cement Concrete Structures	Civil	3	-	-	3	4	70	30	45	-	-	-
2	PCC-VII	BCV5T16	Fluid Mechanics	Civil	3	-	-	3	3	70	30	45	-	-	-
3	PCC-VII	BCV5P16	Fluid Mechanics Lab	Civil	-	-	2	1	-	-	-	-	25	25	25
4	PCC-VIII	BCV5T17	Environmental Engineering	Civil	2	-	-	2	3	70	30	45	-	-	-
5	PCC-VIII	BCV5P17	Environmental Engineering Lab	Civil	-	-	2	1	-	-	-	-	25	25	25
6	PEC-I	BCV5T18	Program Elective-I Refer Program Elective Basket	Civil	3	-	-	3	3	70	30	45	-	-	-
7	PEC-I	BCV5P18	Program Elective-I Lab Refer Program Elective Basket	Civil	-	-	2	1	-	-	-	-	-	50	25
8	MDM-III	BMD5T19	Internet of Things	Civil	3	-	-	3	3	70	30	45	-		-
9	MDM-III	BMD5P19	Internet of Things Lab	Civil	-	-	2	1	-	-	-	-	-	50	25
10	OE-III	BOE5T03	Open Elective – III Refer OE Basket		2	-	-	2	3	70	30	45	-	-	-
			Total		**16**	**-**	**08**	**20**		**420**	**180**		**50**	**150**	

B.Tech. Sem-VI (Civil Engineering-Major)

SN	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	PCC-IX	BCV6T20	Transportation Engineering	Civil	2	-	-	2	3	70	30	45	-	-	-
2	PCC-IX	BCV6P20	Transportation Engineering Lab	Civil	-	-	2	1		-	-	-	25	25	25
3	PCC-X	BCV6T21	Surveying	Civil	3	-	-	3	3	70	30	45	-	-	-
4	PCC-XI	BCV6T22	Design of Steel Structure	Civil	3	-	-	3	4	70	30	45	-	-	-
5	PEC-II	BCV6T23	Program Elective-II Refer Program Elective Basket	Civil	3	-	-	3	3	70	30	45	-	-	-
6	PEC-II	BCV6P23	Program Elective-II Lab Refer Program Elective Basket	Civil	-	-	2	1		-	-	-	-	50	25
7	PEC-III	BCV6T24	Program Elective-III Refer Program Elective Basket	Civil	3	-	-	3	3	70	30	45	-	-	-
8	MDM-IV	BMD6T25	Cyber Ethics and Law	Civil	2	-	-	2	3	70	30	45	-	-	-
9	SEC-II	BSE6P02	Refer SEC Basket Lab		-	-	4	2		-	-	-	50	50	50
			Total		**16**	**-**	**08**	**20**		**420**	**180**		**75**	**125**	

Exit option: Award of UG Degree B.Voc./ B.Sc. in Major with 120 credits and an additional 8 credits in skill-based courses, internship, mini projects etc.

B.Tech. Sem-VII (Civil Engineering-Major)

SN	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	RM	BRM7T26	Research Methodology#	Civil	3	-	-	3	3	70	30	45	-	-	-
2	RM	BRM7P26	Research Methodology Lab	Civil	-	-	2	1	-	-	-	-		50	25
3	PEC-IV	BCV7T27	Program Elective-IV #	Civil	2	-	-	2	3	70	30	45	-	-	-
4	MDM-V	BMD7T28	Renewable Energy Engineering #	Civil	2	-	-	2	3	70	30	45	-	-	-
5	OJT	BOJ7P01	Internship	Civil	-	-	24	12	-	-	-	-	200	200	200
			Total		**07**	**-**	**26**	**20**		**210**	**90**		**200**	**250**	

These courses should be undertaken taken through online mode by NPTEL/ SWAYAM/MOOCS platform or through class room teaching in Department of Civil Engineering of affiliated colleges. Examination will be conducted by RTMNU.

B.Tech. Sem-VIII (Civil Engineering-Major)

SN	Course Code	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
									Theory				Practical		
					(Th)	TU	P		Exam Hrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	PCC-XII	BCV8T29	Estimating& Costing	Civil	3	-	-	3	4	70	30	45	-	-	-
2	PCC-XII	BCV8P29	Estimating& Costing Lab	Civil	-	-	2	1		-	-	-	25	25	25
3	PCC-XIII	BCV8T30	Water Resources Engineering	Civil	3	-	-	3	3	70	30	45	-	-	-
4	PCC-XIII	BCV8P30	Water Resources Engineering Lab	Civil	-	-	2	1		-	-	-	-	50	25
5	PEC-V	BCV8T31	Program Elective-V Refer Program Elective Basket	Civil	3	-	-	3	3	70	30	45	-	-	-
6	PEC-VI	BCV8T32	Program Elective-VI Refer Program Elective Basket	Civil	3	-	-	3	3	70	30	45	-	-	-
7	MDM-VI	BMD8T33	Electrical Power System	Civil	2	-	-	2	3	70	30	45	-	-	-
8	PROJ	BPR8P01	Project	Civil	-	-	8	4	-	-	-	-	100	100	100
			Total		**14**	**-**	**12**	**20**		**350**	**150**		**125**	**175**	

4-Years Bachelor's degree (B.Tech.) in Engg./Tech. with Multidisciplinary Minor

LIST OF OPEN ELECTIVE OFFERED BY CIVIL ENGINEERING BOS

(Students of Civil Engineering will not be able to opt these OE courses)

S.NO	SEMESTER	COURSE CODE	COURSE NAME
1	3rdsem	BOE3T01	Building Construction Materials and Practices
2	4thsem	BOE4T02	Environmental Management
3	5thsem	BOE5T03	Introduction to Vastushastra

LIST OF INDIAN KNOWLEDGE SYSTEM COURSES (IKS) OFFEREDBYCIVILENGINEERING BOS

(Offered by Applied Science Board and Humanities)

S.N.	Semester	Category	Course code	Course name
1	2nd sem	IKS-I	BCSE2T05A	Consciousness Studies
2			BCSE2T05B	Preserving Art, Culture and Tradition
3			BCSE2T05C	Wellness, traditional medicines and yoga
4			BCSE2T05D	Glimpses of ancient Science and Technology

LIST OF SKILL ENHANCEMENT COURSES (SEC) OFFERED BY CIVIL ENGINEERING BOS

S.N.	Semester	Course Code	Course Name
1	2nd sem	BSE2P01	~~Construction Workshop Practices~~ Introduction to Computer Aided Drawing
2	6thsem	BSE6P02	Surveying Lab

LIST OF PROGRAM ELECTIVE COURSES (PEC) CIVIL ENGINEERING

S.N.	Semester	Category	Course code	Course name
1	5thsem	PEC-I	BCV5T18A	Advanced Construction Materials
2			BCV5T18B	Advanced Geotechnical Engineering
3			BCV5T18C	Advanced Structural Analysis
4	6thsem	PEC-II	BCV6T23A	Water and Waste Water Treatment
5			BCV6T23B	Fluid Power
6			BCV6T23C	Advanced Concrete Structures
7		PEC-III	BCV6T24A	Precast And Modular Construction Practices
8			BCV6T24B	Urban Transportation Planning
9			BCV6T24C	Drone Surveying
10	7thsem	PEC-IV	BCV7T27A#	Retrofitting and Rehabilitation of Civil Infrastructure#
11			BCV7T27B#	Sustainable Materials & Green Buildings#
12			BCV7T27C#	Disaster Recovery and Build Back Better#
13	8thsem	PEC-V	BCV8T31A	Waste Management
14			BCV8T31B	Town planning
15			BCV8T31C	Pavement Analysis and Design
16		PEC-VI	BCV8T32A	Advanced Traffic Engineering
17			BCV8T32B	Construction Management And Machinery
18			BCV8T32C	Statistics in Hydrology

These courses should be undertaken taken through online mode by NPTEL/ SWAYAM/MOOCS platform or through class room teaching in Department of Civil Engineering of affiliated colleges. Examination will be conducted by RTMNU.

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BCV1T01	Matrices and Differential Calculus	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	The topics covered will equip them the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power.
2	The aim is to inculcate and develop the basic mathematics skills of engineering students that are imperative for effective understanding of engineering subjects.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Apply elementary transformations to determine its rank and interpret the various solutions of system of linear equations. Identify the special properties of a matrix such as the eigen value, eigen vector, to express the matrix into diagonal form.
2	Apply the concept of successive differentiation to express the function in series form and evaluation of indeterminate forms.
3	To understand the significance of derivatives of functions of several variables and use it to find series approximation to the functions of two variables, extreme values of the functions and functional relationship.
4	To solve ordinary differential equations using elementary techniques and apply it to formulate mathematical models for simple electrical circuits.
5	To solve higher order differential equations by using various techniques and apply it to solve the problems in engineering field.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit-1 Matrices			

Rank of a matrix, Consistency of linear system of non-homogeneous and homogeneous equations, Linear dependence of vectors, Eigen values and Eigen vectors, Cayley- Hamilton theorem, Sylvester's theorem (Statement only), Inverse of matrix	7		1
Unit 2: Differential Calculus			
Successive differentiation: Leibnitz's Rule, Taylor's and Maclaurin's series for function of one variable, Indeterminate forms and L'Hospital's Rule.	5		2
Unit 3: Multivariable Calculus (Differentiation)			
Functions of several variables, First and Higher order partial derivatives, Euler's theorem, Chain rule and Total differential coefficient, Functional Relationship between two functions using Jacobians, Taylor's and Maclaurin's series for function of two variables. Maxima and Minima for function of two variables, Lagrange's method of undetermined multipliers.	10		3
Unit 4: First Order Ordinary Differential Equations			
Reducible to linear (Bernoulli's) differential equations, Exact differential equations (excluding the cases of integrating factors), Equations of first order and higher degree: Solvable for p, Solvable for y, Solvable for x and Clairaut's type, Application of first order differential equation to simple electrical circuits.	5		4
Unit-5:Higher Order Ordinary Differential Equations			
Higher order ordinary linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's homogeneous differential equations, Equations of the type $d^2y/dx^2=f(y)$.	9		5

Text/Reference Books:

(1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
(2) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint, 2010.
(3) N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
(4) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
(5) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.
(6) H. K. Dass, Rama Verma, RajnishVerma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Engineering Mathematics, Volume I and II, S. Chand.

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B.TECH- CIVIL ENGINEERING

Sem: I	Total Hours Distribution per week	
Total Credit : 2	Lecture (L): 2Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BCV1T02	Applied Physics

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To introduce ideas of quantum mechanics necessary to understand the function of semiconductor devices
2	To gain an understanding of the phenomenon of interference used for advanced applications in optics
3	To familiarize prospective engineers with fundamental concepts of semi conductors and their applications in semiconductor technology
4	To make acquainted with the laser technology and the operations of Laser

Course Outcomes	
After completion of syllabus, students would be able to	
1	Learn the basic concepts of the dual nature of matter and wave packet and apply them to analyze various relevant phenomena and to solve related numerical problems.
2	Apply concepts in interference and diffraction to solve relevant numerical problems and to relate to relevant engineering applications
3	Identify and explain different types of diodes, transistors, and its applications.
4	Learn and explain quantum transitions and apply them to the working of lasers.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit-1 Quantum Mechanics			
Concept of wave-particle duality, De-Broglie Hypothesis, Matter Waves, Davisson-Germer Experiment; Bohr's Quantization condition. Concept of wave packets, Heisenberg Uncertainty Principle. Schrodinger wave equation (time dependent and time independent), Wave function Ψ and	6		1

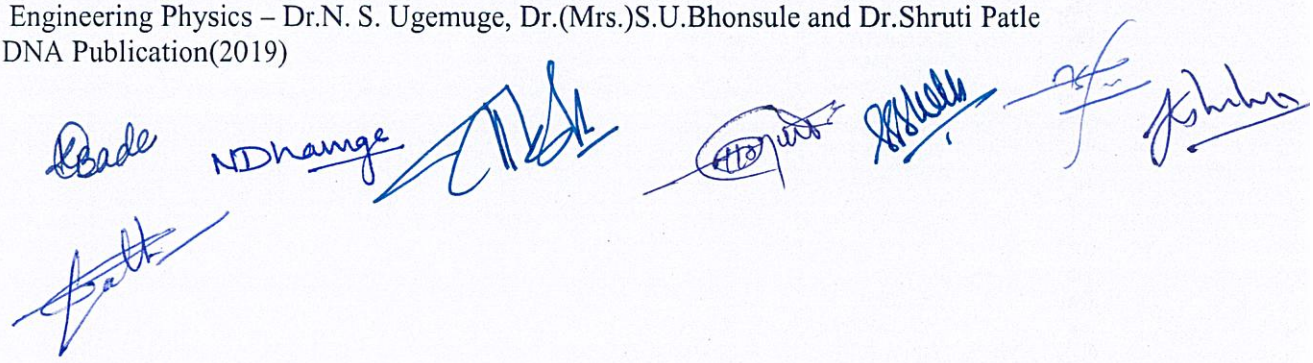
normalization condition, Application to one dimensional infinite potential well.			
Unit 2: Wave optics			
Huygen's principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting, Interference in thin films, Interference in Wedge-shaped thin film, Newton's rings, and Anti-reflection coating.	6		2
Unit 3: Semiconductor Devices			
Semiconductor, Classification, Pure and doped semiconductors. Types of Semiconductor diodes -P-N junction Diode, Tunnel Diode, Zener Diode, Light Emitting Diode (LED), Photodiode. Transistors, Hall Effect, Hall voltage, and Hall coefficient; its applications.	6		3
Unit 4: Lasers			
Quantum Transitions: Absorption, Spontaneous emission & stimulated Emission, Metastable states, Principle of laser, Laser characteristics, Coherence length and coherence time, Pumping schemes: Three level and Four level. Optical Resonator, Construction & working of Ruby laser and He-Ne laser, Semiconductor diode laser, Applications of laser.	6		4

Text Books &Reference Books

1. P. M. Mathews and K. Venkatesan, A Textbook of Quantum Mechanics, Tata McGraw Hill (1977).
2. J. L. Powell and B. Crasemann, Quantum Mechanics, Narosa Publishing House (1993).
3. Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition, (1983).
4. A. J. Dekker, Solid State Physics, Prentice Hall of India (1971).
5. A Textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication
6. Text book of Applied Physics, Dr. D. S. Hardas, Dr. D. S. Bhoumik, Dr.S. Shastri, Das Ganu Publication ISBN-978-93-84336-59-2 (2021)
7. Applied Physics, M. N. Avdhanulu, Shilpa A. Pande, Arti R. Golhar, Mohan Giriya, S. Chand
8. A Text Book of Engineering Physics Dr. DevashreeHardas& Dr. Ashish Panat, Das Ganu Publication ISBN-978-81-921757-7-5 (2011)
9. Applied Physics, - Dr. (Mrs) S.P. Wankhede, Dr.ShrutiPatle, Dr. (Mrs.)S.U.Bhonsule and Dr.N. S. Ugemuge DNA Publication ISBN-978-81-945174-6-7 (2020)
10. Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by R. Eisberg and R. Resnick, Wiley and Sons
11. Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press(India) Pvt. Ltd.(2016)
12. D. J. Griffiths, Quantum mechanics, Prentice Hall of India Private Limited, New Delhi
13. L. I. Schiff, Quantum Mechanics, TMH Publications
14. Advanced Engineering Materials - Dr. Sangeeta G. Itankar, Dr. Manjusha Dandekar, Dr. Tushar R. Shelke, Dr. Swati Fartode, Alliance & Co. ISBN 978-93-91322-12-0 (2023)
15. Applied Physics- Dr. Sangeeta G. Itankar, Dr. Manjusha Dandekar, Dr. Tushar R. Shelke, Dr. Swati Fartode, Alliance &Co. ISBN 978-93-91322-97-7 (2023)
16. David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10th Edition, John Wiley and Sons (2017)
17. Advanced physics - Dr.ShrutiPatle, Dr.(Mrs).S.U.Bhonsule, Dr.Ashish N. Bodhaye,

Dr.ManoharD.Mehare DNA Publication (2019)

18. Engineering Physics – Dr.N. S. Ugemuge, Dr.(Mrs.)S.U.Bhonsule and Dr.Shruti Patle DNA Publication(2019)



RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Course Code	BCV1P02	Applied Physics Lab	
Examination Scheme –Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments: Performance of at least eight experiments is compulsory in a semester.

Exp. No.	List of Experiments
1	Energy gap of semiconductor /thermistor.
2	Parameter extraction from V-I characteristics of PN junction diode.
3	Parameter extraction from V-I characteristics of Zener diode.
4	Parameter extraction from V-I characteristics of PNP/NPN transistor in CB and CE mode.
5	V-I Characteristics of Tunnel diode.
6	V-I Characteristics of Light Emitting Diodes/ Determination of Plank's constant by using LEDs.
7	Study of Diode rectification.
8	Study of Hall Effect and determination of Hall Voltage of a given sample.
9	Variation of Hall coefficient (RH) with temperature.
10	To study B-H curve and to find out the values of coercivity, retentivity, and saturation magnetization of the experimental material.
11	Determination of NA for optical fiber
12	Calibration of Time Base circuit of CRO and determination of AC, DC voltage & frequency of electrical signals using CRO.
13	To determine the number of lines per cm on a diffraction grating using a LASER beam.
14	Virtual Lab: Experiment on the determination of the thickness of a thin foil using an air wedge arrangement.
15	Virtual Lab: Experiment on the determination of the refractive indices of the material corresponding to ordinary and extra - ordinary rays.

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FACULTY OF SCIENCE & TECHNOLOGY
BTECH CIVIL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit:	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hrs.	Practical (P): 0 Hrs.
Subject Code	BCVE103T	Name of Subject: Engineering Graphics for Civil	

Examination Scheme			
Internal Marks:	University Marks:	Maximum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objective	
1	To acquire basic knowledge about engineering drawing language, line types, dimension methods, simple geometrical construction and building elements.
2	To acquire basic knowledge about physical realization of engineering objects and shall be able to draw their isometric views and knowledge about single line plans.
3	To visualize residential and public buildings and shall be able to draw their plan and elevations
4	To understand different components and services of a residential buildings and shall be able to draw their plan and elevations
5	To acquire basic knowledge about perspective drawing and draw simple perspective views

Course Outcome	
After completion of syllabus student able to	
1	understand the basic knowledge of lines, dimensioning techniques, scales, sheet layout, construct the orthographic projection and also will be able to draw free hand sketches of building elements
2	apply the visualization skill to draw a simple isometric projection/view using drawing equipment and draw single line plan and elevation of a single room building
3	prepare drawings (e. g. plan, elevation) of the residential and public buildings
4	draw different components and services of a residential buildings
5	prepare simple perspective drawings

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit 1: Introduction to Engineering Graphics and Building elements	7		1
Introduction to Engineering Graphics, Use of various drawing instrument, Sizes of drawing sheets			
different types of lines used in drawing practice			
Dimensioning linear, angular, aligned system, unidirectional system			
Introduction to scales & scale factor (RF)			
Free hand sketches of basic building elements			
Unit 2: Isometric Projections and Building Drawing	8		2
Isometric view & Isometric projection of prism & pyramid with axis horizontal and vertical with construction of isometric scales			
Isometric view & Isometric projection of cone & cylinder with axis horizontal and vertical with construction of isometric scales			
Terms related to building drawing, Single line plan of a building			
elevation of single room building with verandah (Flat roof according to given line plan and specification)			
Layout plan, site plan of a building			
Unit 3: Single line Plan and elevation of buildings	7		3
Residential Buildings- Bungalows, Apartments/Flats etc.			
Public Buildings - Building for education: schools, colleges, institutions, libraries etc.			
Public Buildings -Buildings for health: hospitals, primary health centres etc.			
Public Buildings -Office buildings: banks, post offices, commercial complexes etc.			
Public Buildings -Building for public residence: hostels, boarding houses, guest houses etc.			
Unit 4: Components and Services of a residential Building	7		4
Staircase: (dog legged & open newel type)			
Foundations: stepped footing, isolated sloped footing and combined footing			
Openings: doors and windows			
Types of pitched roof (plan and elevation)			
Building services: Water supply, sanitary and electrical layouts			
Unit 5: Perspective drawing	7		5
One-point perspective			
Two-point perspective ofResidential building neglecting small elements of building such as plinth offset, lintel projections etc.			

References Books

1. Engineering Drawing, Bhatt, N. D. and Panchal, V.M., Charotar Publication, 2016
2. A Textbook of Engineering Drawing, Dhawan, R.K, S. Chand, New Delhi, 2000

3. Building Drawing with an Integrated Approach to Built Environment, M. G. Shah, C.M. Kale, S. Y. Patki, Tata McGraw-Hill Education, Sixth, 2020
4. Civil Engineering Drawing (including Architectural aspect), M. Chakraborti, Monojit Chakraborti Publications, Kolkata, 2015

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BCV1P03	Engineering Graphics for Civil Lab	
Examination Scheme - Practical			
Internal Marks:	University Marks:	MinimumPassing Marks:	Examination Duration:
50 Marks	-	25 Marks	--

Practical Course Objectives	
1	To acquire basic knowledge about engineering drawing language, line types, dimension methods and simple geometrical construction.
2	To acquire basic knowledge about physical realization of engineering objects and shall be able to draw their isometric views and knowledge about single line plans.
3	To visualize residential and public buildings and shall be able to draw their plan and Elevations
4	To understand different components and services of residential buildings and shall be Able to draw their plan and elevations
5	To acquire basic knowledge about perspective drawing and draw simple perspective views

Practical Course Outcomes	
After completing the practical course, students will be able to	
1	Understand the basic knowledge of engineering graphics such as instruments, lines, dimensioning techniques, scales, sheet layout, construct the various engineering curves using the drawing instruments and basics of orthographic projection through drawing the Projection of point and line
2	Apply the visualization skill to draw a simple isometric projection/view from given Orthographic views precisely using drawing equipment and draw single line plan and elevation of a single room building
3	Prepare drawings (e.g. plan, elevation) of the residential land public buildings
4	Draw different components and services of a residential buildings
5	Prepare simple perspective drawings

LIST OF PRACTICAL:

Pr. No.	List of Practical
1	Types of lines, dimensioning, free hand building components
2	Minimum 4 problem on Isometric View showing building elements
3	Minimum 2 drawings of Single line plan and elevation of a single room residential building with verandah
4	Minimum 2 drawings of Single line plan and elevation of single storey residential buildings (3 rooms)

5	Minimum 2 drawings of Single line plan and elevation of public buildings
6	Minimum 2 problems on one-point and two-point perspective

References:

1. Bhatt, N.D. and Panchal, V.M.,(2016),"Engineering Drawing", Charotar Publication, Anand, India
2. Dhawan, R.K. ,(2000), "A Textbook of Engineering Drawing", S.Chand, NewDelhi
3. M.G.Shah,C.M.Kale,S.Y.Patki(2012),"BuildingDrawingwithanIntegratedApproach to Built Environment", Tata McGraw-Hill Education
4. Jolhe, D.A.,(2015),"Engineering Drawing" Tata Mc Graw Hill, New Delhi
5. ShahP.J,(2012),"Basics of Engineering Graphics", S. Chand, New Delhi
6. M. Chakraborti (2017) "Civil Engineering Drawing(including Architectural aspect)", Monojit Chakraborti Publications, Kolkata

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BCV1T04	Fundamentals of Vastushastra	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	Basic ideology behind the use of vastushatra is to have better life.
2	The whole purpose of vastushatra is to create and attract positive cosmic energy.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand the fundamentals of vastushastra
2	Understand the basics of interior and exterior of various building units
3	Understand the orientations of various rooms of residential as per vastushastra
4	Understand the defects as per vastu and remedial measures to rectify.
5	Understand the Building Planning by Laws

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT 1: Introduction of Vaastu			
Scientific background of Vaastu, Understanding Life force Energy, Importance of Five Elements, Use of Magnetic Compass,Types, shapes and selection of Land, Types of Soil Testing Vastu Methods	8		1
UNIT 2: Interiors and Exteriors			
Open Space planning and Building Design,Floor level, Height factors, Verandas, Balconies, Porch, Basements, Sumps & Borings,Boundary Walls, Parking, Security Guard Room, Overhead Tanks, Septic Tanks, Water flow, Plants and Greenery.	6		2
UNIT 3: Orientation of Home			
Master Bed Room , Kids room, Living Room, Kitchen, Dining Room,Bathroom, Drawing room, Study Room, Puja Room, Library, Store	8		3

room, Furniture making, Doors, Windows and ventilators, Main Entrance, Staircase, Servants room, Guest room.			
UNIT 4: Remedial Vaastu			
Identifying the Vastu Defects, Rectification of Vastu Defects in Existing Building, Color therapy.	6		5
UNIT 5: Building Planning by Laws			
Introduction to Building by Building Planning, Principle of Planning, Discussion on different building plans, Introduction to bye-laws	8		5

References Books

1. Ancient Science of Vastu by Siddharth Board and Dr. Jayshree Om.
2. Remedial Vaastu for home by Janhavi N. Sahasrabuddhe and Narendra Hari Sahasrabuddhe.
3. Scientific VaastuShastra in Home by Patel Sarjoo

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BCV1P04	Fundamentals of Vastushastra Lab	
Examination Scheme – Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments:

Exp. No.	List of Experiments:
1	Planning of interior components of residential building by Vastushastra
2	Planning of exterior components of residential building by Vastushastra
3	Review of residential building plan as per Vastushastra
4	Remedial plan as per Vastushastra

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B.TECH. CIVIL ENGINEERING

Sem: I	Total Hours Distribution per week	
Total Credit : 1	Lecture (L): 1Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BAE1T01	Communication Skills

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
15 Marks	35 Marks	23 Marks	2 Hours

Course Objectives	
1	Students would be able to enhance their communication skills.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Construct grammatically correct sentences.
2	Identify and overcome barriers of communication.
3	Demonstrate good Listening and speaking skills.
4	Develop effective reading and writing skills.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT 1			
Grammar: Tenses and its types, sentences and its Types, Transformation of Sentences (Assertive, Affirmative, Negative, Interrogative, Exclamatory) Reported speech	4		1
UNIT 2			
Introduction to Communication, Importance of communication Types of communication - Verbal and non-verbal Communications: - Kinesics, Vocalics, Chronemics, Haptics, Proxemics), Barriers to communication and methods to overcome them.	3		2
UNIT 3			
Introduction to LSRW Skills-, Listening Skills: Importance of listening, Types of listening, listening barriers and methods to overcome, Speaking Skills: Components of public speaking, Essential steps for public speaking, Overcoming stage fear in public speaking, Do's, and	4		3

Don'ts of Public speaking			
UNIT 4Remedial Vaastu			
Reading Skills: Importance of reading skills, Types of reading, omprehending passages, Writing Skills: Importance of effective writing, Paragraph writing, Email etiquettes.	3		4

References Books

1. Technical Communication by Meenakshi Raman and Sangeeta Sharma, OUP
2. Public Speaking and Influencing Men in Business by Dale Carnegie
3. Professional Communication Skills by Bhatia and Sheikh, S. Chand Publications
4. Communication Skills by Sanjeev Kumar and Pushpalata, OUP
5. Communication Skills by LalitaBisen, Bhumika Agrawal, N. ThejoKalyani, Himalaya Publishing House

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B.TECH. CIVIL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BAE1P01	Communication Skills Lab	
Examination Scheme – Practical			
Internal Marks:	University Marks:	MinimumPassing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments: Any 8 experiments

Exp. No.	List of Experiments:
1	Barriers to Communication
2	Non-verbal Communication
3	Listening Skills
4	Reading Skills
5	Speaking Skills
6	Presentation Skills
7	Group Discussion
8	Interview Techniques
	Beyond/Additional Syllabus Experiments
9	Development of Word Power
10	Use of Figurative language

Textbooks/Reference Books

1 Technical Communication by Meenakshi Raman and Sangeeta Sharma, OUP
2 Public Speaking and Influencing Men in Business by Dale Carnegie
3 Professional Communication Skills by Bhatia and Sheikh, S. Chand Publications
4 Communication Skills by Lalita Bisen, Bhumika Agrawal, N.ThejoKalyani, Himalaya

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: I	Total Hours Distribution per week		
Total Credit :2	Practical (P): 4 Hrs.		
Subject Code	BVS1P01	Construction Workshop Practices Lab	
Examination Scheme – Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
50 Marks	50 Marks	50 Marks	--

List of Experiments: Performance of at least any eight experiments is compulsory in a semester.

Exp. No.	List of Experiments
1	Setting out of a building: The student should set out a building (two room only) as per the given building plan using tape only.
2	Construct a wall of height 60 cm and wall thickness 1½ bricks using English bond (Without mortar) - corner portion – length of side walls 100cm.
3	Construct a wall of height 60 cm and wall thickness 2 bricks using English bond (Without mortar) -corner portion – length of side walls 100 cm.
4	Installation of plumbing and fixtures like Tap, T-Joint, Elbow, Bend, etc
5	Preparation of mortar.
6	Preparation of concrete & testing for compressive strength
7	Casting and testing of Fly ash bricks.
8	Casting of paver block.
9	Site visit on ongoing construction site.
10	Study of various construction tools.
11	Study and scope of BIS codes (minimum 10)

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: II	Total Hours Distribution per week	
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BCV2T05	Numerical Methods

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	The objective of the course is to inculcate and strengthen analytical ability among the engineering students and to create zeal of working with higher mathematics and its applications in the extensive field of engineering. The topics covered will serve as the basic tool for specialized studies in the field of engineering and technology

Course Outcomes	
After completion of syllabus, students would be able to	
1	Apply different methods to solve Algebraic and Transcendental Equations.
2	To understand the various methods suitable and apply to solve the system of simultaneous linear equations.
3	To solve ordinary differential equations numerically by using the various methods and formulae.
4	To solve the problems having unequal and equal interval data by using suitable formula and fitting of curve using the given data.
5	Solving the problems of differentiation and integration numerically.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit-1 Solution of Algebraic and Transcendental Equations			
Types of iterative methods: Bisection method, Method of False position, Newton Raphson method and their convergence, Newton Raphson method for multiple roots, Direct iteration method.	7		1
Unit 2: Solution of system of simultaneous linear equations			
Gauss elimination method, Gauss Seidel method, Gauss Jordan method, Crout's method Largest Eigen value and its corresponding Eigen vector by iteration method.	6		2
Unit 3: Numerical solution of Ordinary differential equations			

Taylor's series method, Picards method, Euler's modified method, Rungekutta method of 4^{th} order, Milne's Predictor-Corrector method, RungeKutta method to solve simultaneous first order differential equations.	10		3
Unit 4: Interpolation			
Lagranges interpolation formula for unequal intervals, Newton's Forward and backward difference formula, Stirling central difference formula, Curve fitting.	8		4
Unit-5:Numerical Differentiation and Integration			
Numerical Differentiation: Forward, Backward and Central difference formula, Numerical Integration: Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule.	6		5

Text/Reference Books:

(1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

(2) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint, 2010.

(3) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

(4) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

(5) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.

(6) H.K Dass, Rama Verma, RajnishVerma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Engineering Mathematics, Volume I and II, S. Chand.

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: II	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BCV2P05	Numerical Methods Lab	
Examination Scheme – Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

Practical Course Objectives	
1	Solving problems using Open-Source Software SCILAB Programming Language

Practical Course Outcomes	
After completing the practical course, students will be able to solve the following using SCILAB Programming Language.	
1	Algebraic and Transcendental Equations by iterative methods.
2	System of simultaneous linear equations by iterative methods and direct methods.
3	Largest Eigen value and its Eigen vector of a matrix by iteration method.
4	Ordinary differential equations numerically by using the various iterative methods.
5	Interpolation Problems of unequal interval data and equal interval data.
6	Problems of numerical differentiation and integration for equal interval data.

LIST OF PRACTICAL: Performance of at least **SIX** practical is compulsory in a semester.

Pr. No.	List of Practical
	Unit-1 Solution of Algebraic and Transcendental Equations (06 Hours)
1	Write a SCILAB Program to solve Algebraic and Transcendental Equations by one of the iterative methods: Bisection method, and Method of False position.
2	Write a SCILAB Program to solve Algebraic and Transcendental Equations by one of the iterative methods: Newton Raphson method, Newton Raphson method for multiple roots and Direct iteration method.
	Unit 2: Solution of system of simultaneous linear equations: (04 Hours)
3	Write a SCILAB Program to solve the system of simultaneous linear equations by one of the iterative methods: Gauss Jordan method, and Gauss Seidel method,
4	Write a SCILAB Program to solve the system of simultaneous linear equations by one of the direct methods: Gauss elimination method, and Crout's method
5	Write a SCILAB Program to find the Largest Eigen value and its corresponding Eigen vector of a matrix by iteration method.
	Unit 3: Numerical solution of Ordinary differential equations: (04 Hours)

6	Write a SCILAB Program to solve ordinary differential equations numerically by the iterative method: Euler's modified method
7	Write a SCILAB Program to solve ordinary differential equations numerically by the iterative method: Runge Kutta method of 4^{th} order
8	Write a SCILAB Program to solve ordinary differential equations numerically by the iterative method: Milne's Predictor-Corrector method
	Unit 4: Interpolation: (04 Hours)
9	Write a SCILAB Program to solve the Interpolation Problems for unequal interval data by the formula: Lagranges interpolation formula
10	Write a SCILAB Program to solve the Interpolation Problems for unequal interval data by one of the formulas: Newton's Forward and backward difference formula, Stirling central difference formula
	Unit-5: Numerical Differentiation and Integration: (06 Hours)
11	Write a SCILAB Program to solve the problem of Numerical Differentiation by one of the formulas: Forward, Backward and Central difference formula
12	Write a SCILAB Program to solve the problem of Numerical Integration by one of the formulas: Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule.

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B.TECH. CIVIL ENGINEERING

Sem: II	Total Hours Distribution per week	
Total Credit: 3	Lecture (L): 3Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BCV2T06	Applied Chemistry

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

	Course Objectives
1	To create awareness about various materials used in modern technology and their interaction amongst themselves as well as environment
2	To make students learn about the environment and ensuring sustainable development

	Course Outcomes
	After completion of syllabus, students would be able to
1	Apply the basics concepts of electrochemistry & corrosion technology.
2	Know about fuels and lubricants and analyse the situation for their appropriate applications
3	Analyse the various industrial problems arising due to water quality and their remediation.
4	Develop the environmental awareness from the basics of green chemistry and its application.
5	Inculcate the use of instrumentation techniques and interpret its applications in material characterization

SYLLBUS

Details of Topic	Allotment of Hours		Mapped with CO
	L	T/A	
Unit-1: Electrochemistry and Corrosion Technology			
A] Electrochemistry: Electrochemical & Galvanic Series, Electrochemical & Electrolytic cell, Battery: Introduction, types, characteristics, components/materials, working and applications of Lithium-cobalt oxide and metal air batteries. Super capacitors: Introduction, types (EDLC, pseudo and asymmetric capacitor) with examples and applications. Energy conversion devices: Introduction, characteristics, materials, working and applications of H_2-O_2 fuel cells, amorphous Si and quantum dot sensitized solar cells. B] Corrosion: Theories of Corrosion (Dry, Wet and Differential Aeration), Pilling Bedworth Rule & Numerical, Factors affecting corrosion, Types of Corrosion (Waterline, pitting & Stress), Corrosion Protection- Design & Material Selection, Cathodic Protection	4+3		1

(Galvanic & Impressed Current)			
Unit-2: Fuels			
A] Fuels: Introduction: Calorific value, Higher and lower calorific value; determination of calorific value by Bomb and Boy's calorimeter; numerical based on calorific value determination; B] Liquid fuels –fractional distillation of crude petroleum(boiling point wise separation only) use of gasoline and diesel in internal combustion engine: knocking and chemical constitution of fuel, Octane and Cetane number, doping agents, Introduction to propellants and its classification.	4+3		2
Unit-3: Water Technology			
A] Water Purification Technology: Principles of coagulation and flocculation, Sterilization by using ozone and chlorine (Cl_2 gas & chloramine), Break point chlorination and its significance. Industrial Water Treatment: Softening of water-principle- reactions, advantages, limitations and comparison of Zeolite process, and Demineralization process. Numerical based on Zeolite process. B] Boiler Troubles–Causes, effect on boiler operation and methods of prevention – Scales and sludges. Desalination of sea water- Principle, method and advantages of electro dialysis and reverse osmosis processes	4+3		3
Unit-4: Green Chemistry			
A] Green Chemistry: Introduction, twelve principles of Green chemistry with examples, Numerical based on atom economy, Carbon sequestration & Carbon Credits B] Green reagents, Dimethyl carbonate and its applications, Supercritical carbon dioxide properties and applications Biopolymers: Classification based on type, properties and applications of collagen, chitosan.	4+3		4
Unit – 5: Material Characterisation Techniques			
Principles and applications of – A] Electronic Spectroscopy (Beer-Lambert's law and its numerical), Infra-Red spectroscopy and Nuclear Magnetic Resonance spectroscopy. B] Thermal analysis (Thermogravimetry, Differential Thermal Analysis, Differential Scanning Calorimetry), Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic Force Microscopy, Brunauer Emmett-Teller (BET) surface area analysis, X-ray Diffraction Analysis, particle size analyser (Dynamic Light Scattering), High Performance Liquid Chromatography and Gas Chromatography	4+3		5

References/ Text Books

1. Engineering Chemistry, S S Dara, S Chand Publication
2. Engineering Chemistry, Jain & Jain, Dhanpat Rai Publication
3. Applied Chemistry, A V Bharati, Das Ganu Publication
4. Energy & Environment, A V Bharati, Das Ganu Publication
5. Spectroscopy, Y R Sharma, S Chand
6. Green Chemistry for Beginners, Anju Srivastava, Rakesh K. Sharma, Jenny Stanford Publishing
7. Instrumental Methods of Chemical Analysis, B. K. Sharma, Krishna Prakashan.
8. https://wiki.anton-paar.com/in-en/the-principles-of-dynamic-light-scattering/
9. Fundamentals of Solid Propellant Combustion, Kuo, K.K., Summerfield, M., Progress in Astronautics

& Aeronautics, Vol. 90, AIAA. 1984
10. https://onlinecourses.nptel.ac.in/noc24_ae09/preview

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: II	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BCV2P06	Applied Chemistry Lab	
Examination Scheme – Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
50 Marks	--	25 Marks	--

List of Experiments: Performance of at least Anysix performance based and one virtual lab experiments is compulsory in a semester.

Exp. No.	List of Experiments
1	Proximate Analysis of coal
2	Estimation of viscosity of oil by Redwood Viscometer 1 or 2
3	Estimation of Flash point of lubricating oil by open/ closed cup apparatus
4	Estimation of Acid value of lubricant
5	Estimation of Consistency of grease by penetrometer
6	Estimation of Saponification value of lubricant
7	Estimation of Hardness of water (Total, Permanent & Temporary) by complexometry
8	Estimation of Alkalinity of water (Warder's Method)
9	Estimation of DO / free chlorine estimation
10	Estimation of Copper estimation (iodometrically)
11	Estimation of Ni by complexometry / gravimetry.
12	Fe(II)/ (III) estimation by redox titration.
13	Beer's Law verification by spectrophotometer.
14	Separation of copper nickel ions by paper chromatography.
15	Acid base titration by potentiometry
16	Acid base titration by potentiometry
17	Acid base titration by conductometry
18	Virtual Lab: Experiment on Calorimetry

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B.TECH. CIVIL ENGINEERING

Sem: II	Total Hours Distribution per week	
Total Credit: 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): Hrs.
Subject Code :	BCV2T07	Name of Subject: Engineering Mechanics

Examination Scheme			
Internal Marks:	University Marks:	Maximum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objective	
1	To Understand the force systems and draw free body diagram to analyze rigid body equilibrium.
2	To Comprehend the principles of friction and solve engineering mechanics problems associated with frictional force.
3	To introduce the concept of centriod and moment of inertia of plane area.
4	To make student aware about the method of joint and method of section to analyse the truss.
5	To Understand the concept of motion of particles and rigid bodies.

List of Course Outcome	
After completion of syllabus student able to	
1	Analyse a given force system and apply the knowledge of force system and moment to determine resultant of various force system & apply the knowledge of equilibrium of force system.
2	To apply the basics of friction
3	Locate Centroid and compute area Moment of Inertia for standard shapes and composites areas.
4	Analyze simple determinate trusses
5	Analyze the connected system of particles using concept of dynamic equilibrium

SYLLBUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT 1: Basics Concepts and equilibrium of force systems			1
Introduction to Engineering Mechanics: Force Systems, Basic concepts, Rigid Body equilibrium;	3		
System of Forces, Coplanar Concurrent Forces, Resultant Moment of	4		

Forces and its Applications; Couples in 2D and 3D			
Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems. Simple beams and support reactions. Diagram of Statically Determinate Beams.	3		
UNIT 2: Friction			2
Types of friction, Limiting friction, Laws of Friction, Static Friction; Motion of Bodies, wedge friction, ladder friction Belt friction	5		
UNIT3: Centroid and Moment of Inertia			3
Centroid and Centre of Gravity, Centroid of standard shapes and application to composite plane shapes; Area moment of inertia: formula of area moment of inertia of standard shapes, parallel and perpendicular axis theorem, application to composite plane shapes	7		
UNIT4: Analysis of structures- Trusses			4
Assumption and Analysis of simple trusses by method of joints & method of sections	5		
UNIT5: Kinetics of Particles			5
Kinetics of particles D'Alemberts principle and its application in connected system of particles, Impulse Momentum, Collision of bodies, Work Energy Method.	5		

References/ Text Books

1. Vector Mechanics for Engineers: Statics and Dynamics, Johnston. R.E., Beer. F., Eisenberg. E. R, & Mazurek. D., McGraw Hill
2. Engineering Mechanics: Principles of Statics and Dynamics, R. C. Hibbler, Pearson Press
3. Engineering Mechanics, S SBhavikatti, Newage International publication

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B.TECH. CIVIL ENGINEERING

Sem: II	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BCV2P07	Engineering Mechanics Lab	
Examination Scheme – Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

Note: Minimum eight practical shall be performed from list of experiments out of which any Two practical may be performed using virtual lab.

Exp. No.	List of Experiments
01	Jib Crane Experiment: Equilibrium of coplanar force system, Analyzing forces acting on a jib crane to determine forces.
02	Law of Moment.
03	Law of Polygon of forces: Verification of law of polygon of forces.
04	Parallel force apparatus: Equilibrium of coplanar parallel force system. /Determining the Support reaction using Simply supported beam / parallel force apparatus.
05	Shear legs apparatus: Equilibrium of Non coplanar Concurrent force system.
06	Coil Friction apparatus: Determining the Coefficient of static friction using coil friction apparatus.
07	Inclined Plane setup: Determination of coefficient of static friction for different surfaces (Materials).
08	Flywheel Apparatus: Determination of mass moment of inertia of a flywheel.
09	Joint Roof truss apparatus: To calculate the forces in the members of roof truss.
10	To find the forces in the member of truss using graphical method and analytical method.
11	Performance of Simple Lifting Machine: Determination of efficiency and Law of machine of Differential Axle and Wheel.
12	Performance of Simple Lifting Machine: Determination of efficiency and Law of machine of Double Purchase Carb.
13	Performance of Simple Lifting Machine: Determination of efficiency and Law of machine of Single Purchase Carb.
14	Kinetics of particles (Collision of bodies)

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B.TECH. CIVIL ENGINEERING

Sem: II	Total Hours Distribution per week		
Total Credit : 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BCV2T08	Building Construction Materials and Practices	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To prepare the students to understand components of buildings and their functions.
2	To prepare students to understand execution of various constructions material.
3	Familiarize the students to understand the necessity and behavior of foundations

Course Outcomes	
After completion of syllabus, students would be able to	
1	Differentiate and identify types of building materials.
2	Identify components of a building.
3	Know & identify the types of finishing and effects.
4	Select appropriate material for building construction.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT 1			
Stones- Types of Stones, Requirements of Good Building Stones, Dressing of stones, Deterioration and Preservation of Stone Work.	2		1
Bricks - Classifications, Manufacturing of Clay Bricks, Requirements of Good Bricks.	2		
Lime- Classification, Properties.	1		
UNIT 2			
Doors, Windows and Ventilation- Location of Doors and Windows, Technical Terms, Material for Door and Windows	3		2
Form Work- Introduction to Formwork, Scaffolding	2		
UNIT 3			
Foundation-Introduction, Necessity of Foundation, Causes of failure of	3		3

Foundations and Remedial Measures.			
Types of Structure- Load Bearing Structures and Framed Structures.	2		
UNIT 4			
Wall Finishes, Plastering, Paintings, Purposes, Methods, Defects and their Solution, Glass- Types and Uses	4		4

Reference Books:

1. Building Construction by Rangwala.
2. Building Construction & Construction Materials by G. S. Birde & T. D. Ahuja.
3. Building Construction by Arun Kr. Jain Ashok Kr. Jain & B. C. Punmia.
4. Building Construction by Gurucharan Singh.

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B. TECH CIVIL ENGINEERING

Sem: II	Total Hours Distribution per week		
Total Credits: 02	Practical (P): 4Hrs.		
Course Code	BSE2P01	Skill Enhancement Course (Introduction to Computer Aided Drawing)	
Examination Scheme			
College Internal Examination	Semester End Examination	Minimum Passing Marks	Examination Duration
50	50	50	----

List of the activities:

1. Introduction to drafting software and basic commands to draft various shapes like line, square, rectangle circle, arc, etc.
2. Use of editing and dimensioning commands with special emphasis on the use of scale, page set – up for plotting a drawing.
3. Drafting of various types of bonds in brickwork.
4. Drafting of various types of arches.
5. Drafting of various types of doors and windows.
6. Drafting of various types of stairs.
7. Drafting sketches of Spread footing and Reinforced Cement Concrete Column Footing
8. Drafting of a double line plan for a One Bed Room, Hall and Kitchen residential building (including bath and water closet)
9. Drafting of a double line plan for a Two Bed Rooms Hall and Kitchen residential building (including staircase, 1 attached and 1 common toilet)
10. Drafting of a double line plan for a public building like a primary school, college building, bank, clinic, post office, etc.

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B.TECH. CIVIL ENGINEERING

Sem: III	Total Hours Distribution per week		
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BCV3T09	Strength of Materials	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives:

1.	To determine the various mechanical properties of the materials.
2.	To determine the shear force and bending moment at a section for different condition.
3.	To facilitate the concept of bending and its theoretical analysis in a beam to determine the bending and shear stress in a given beam.
4.	To develop slope and deflection equations for beams subjected to various loads.
5.	To determine the torsion in circular section, direct and bending stresses.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Explain the basic concept and mechanical properties of materials.
2	Calculate and draw Shear Force diagram and Bending Moment diagram and their relation.
3	Formulate the bending and shear stresses equations and able to draw bending and shear stress diagram.
4	Formulate slope and deflection equations for beams subjected to various loads by macaulay's method.
5	Analyze and evaluate the torsion in circular section, direct and bending stresses.

SYLLABUS

Details of Topic	Allotment of hours		Mapped with CO Number
UNIT I: STRESS AND STRAIN	**L**	**T**	
Concept of stress and strain, stress strain diagrams and their characteristics for mild steel and TOR steel, stresses and strains in simple, compound and composite bars in uniaxial tension and compression, temperature stresses in simple restrained composite bar, elastic constants and relation between them.	7	--	01

UNIT II: SHEAR FORCE AND BENDING MOMENT			
Types of beams, axial force, shear force and bending moment, relation between load intensity, Shear Force and Bending Moment, Shear Force and Bending Moment diagrams of simply supported and cantilever beams.	7		02
UNIT III: STRESS IN BEAMS			
Bending stresses in beams, assumptions and derivation of simple bending theory, relation between bending moment, bending stress and curvature of homogeneous and composite beams, shear stresses in simple beams, shear flow and shear stress distribution, shear stress in composite beams, combined effect of bending moment and axial force, introduction to principal stresses, maximum shear stresses.	7		03
UNIT IV: DEFLECTION OF BEAMS			
Differential equations of the deflection curve, bending of uniformly loaded beams, deflection of simply supported beams loaded concentrated beam, introduction to Macauley's method, deflection of a simply supported and cantilever beam by the Macauley's method, method of superposition, the deflection of beams with overhangs.	6		04
UNIT V: TORSION, DIRECT AND BENDING STRESS			
Direct and bending stress, introduction to torsional rigidity, assumptions and derivation of relations between torsional moment, shear stress and angle of twist, torsion in thin-walled hollow section, closely coiled helical springs.	6		05

List of Books:

Text Books:

1. Strength of materials, S. Ramamrutham, 17, Dhanpat Rai Publication
2. Strength of materials, R. S. Khurmi, S. Chand Publication
3. Strength of materials, Subramanian R., CBS Publishers and Distributors.

Reference Books:

1. Strength of Materials, F. L. Singer, Haper and Row.
2. Strength of material, R. K. Bansal, Laxmi Publication.

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B.TECH. CIVIL ENGINEERING

Sem: III	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BCV3P09	Strength of Materials Lab	
Examination Scheme – Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
50 Marks	--	25 Marks	--

List of Experiments:

1) The practical are based on theory subject of Strength of Materials and CO's.
2) Minimum eight practical shall be performed from list of experiments.
3) Any one practical may be performed using virtual lab.

Exp. No.	List of Experiments
1	To study the universal testing machine.
2	To determine the tensile strength of steel specimen.
3	To determine flexural strength of timber beam.
4	To determine modulus of rigidity of m.s. bar by torsion test.
5	To determine impact value of metal by Charpy impact test or Izod impact test.
6	To determine Rockwell hardness number for m.s. And aluminium bar.
7	To determine the stiffness of spring and modulus of rigidity.
8	To determine the compressive strength of specimen.
9	To perform shear test on different metals.
10	To perform bending test on wooden beam and find its flexural rigidity.
11	To study various types of strain gauge apparatus.
12	To study standard torsion test on metals.

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B.TECH. CIVIL ENGINEERING

Sem: III	Total Hours Distribution per week		
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BCV3T10	Concrete Technology	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives:

1.	Analyze the properties and behavior of concrete constituents including cement, aggregates, and water, and their significance in determining the properties of concrete.
2.	Design and proportion concrete mixes using various methods (IS, BS, and ACI) to produce concrete mixes that meet specific requirements, taking into account factors such as strength, workability, and durability.
3.	Evaluate the properties and performance of fresh and hardened concrete including assessment of workability, strength, durability, and identification of factors that affect its performance, such as environmental conditions, admixtures, and additives

Course Outcomes	
After completion of syllabus, students would be able to	
1	Explain the properties of the constituent materials of concrete.
2	Examine the properties of fresh concrete and tests to determine these properties.
3	Examine the properties of hardened concrete and tests to determine these properties.
4	Analyse the concrete mix design and apply statistical quality control techniques.
5	Explain admixtures, their role in concrete properties.

SYLLABUS

Details of Topic	Allotment of hours		Mapped with CO Number
UNIT I: Cement And Aggregate	**L**	**T**	
Cement: Constituents of cements, Hydration of cement. Water requirement, Physical properties and testing of cement. Effect of fineness, Initial and final setting of cement, Soundness test. Hardening and compressive strength, Grades and different types of cement.	8		01

Aggregates: Coarse and fine aggregate, normal, light and heavy weight aggregates. Aggregate characteristics and their significance in properties of concrete. Sampling, Particle shape and texture, Bond of aggregate, size & grading of aggregate, strength of aggregate. Mechanical properties and tests, Bulking of sand, Crushed sand, Alkali aggregate reaction. **Water:** Minimum requirement of water for mixing.			
UNIT II: FRESH CONCRETE			
Batching, Mechanical mixers, automatic batching and mixing plants. Efficiency of mixing, Workability and its Measurement, Factor affecting workability, Significance of w/c ratio, cohesiveness of concrete, segregation, bleeding, voids, permeability, Conveyance of concrete, placing of concrete, compaction, curing of concrete, significance and methods, temperature effects on curing and strength gain, Maturity of concrete, Formwork for concrete. Hot and cold weather concreting, Introduction to Ready mix, pumped and self-compacting concrete.	7		02
UNIT III: STRENGTH OF CONCRETRE			
Strength gain, factors affecting compressive strength, Tensile and flexural strengths, relation between compressive and tensile strength. Failure modes in concrete, cracking in compression. Impact strength, fatigue strength, shear, elasticity, Poisson's ratio. **Testing of Hardened Concrete:** Compression test, cube strength and cylinder strength and their relation, effect of aspect ratio on strength. Flexural strength of concrete, determination of tensile strength, indirect tension test, splitting test, accelerated curing test. **Non Destructive Test:** Significance, rebound hammer, ultra-sonic pulse velocity test.	7		03
UNIT IV: Mix Design			
Objectives of mix design, Process, statistical relation between mean and characteristic strength, variance, standard deviation, factors affecting mix properties, grading of aggregates, water/cement ratio etc. Degree of quality control, design of mix by IS method, introduction to road Note No. 4 (BS) and ACI method.	7		04
UNIT V: Additives and Admixtures			
Types of admixtures, natural products, diatomaceous earth, calcined clays of shales, volcanic glasses, by-products–pozzolana, fly ash, silica fume, rice husk ash, metakaolin, G.G. blast furnace slag, admixtures- air entraining, water reducing, accelerators, retarders, plasticizers and superplasticizers, permeability reducing, grouting agents, surface hardeners. **Shrinkage :** Early volume changes, drying shrinkage, mechanism and factors affecting shrinkage, influence of curing conditions, differential shrinkage, carbonation, creep- factors influencing, relation between creep and time, nature of creep, effect of creep.	7		05

Text Books:

1. Gambhir M.L: Concrete Technology Tata McGraw Hill (Second Edition) 1995.Structural
2. M.S. Shetty, Concrete Technology S. Chand & Company New Delhi 2005.

Reference Book:

1. P. Kumar Mehata, Paulo & J.M. Monteiro, Concrete microstructure, properties & materials, Prentice Hall INC & Mcgraw Hill USA.
2. Short & Kenniburg, Light Weight Concrete, Asia Publishing House, Bombay 1963.
3. Chen Orchard D.F.; Concrete Technology-Vol I. & II Applied Science Publishers (Fourth Edition) 1979
4. Neville A.M., J.J. Brook Properties of Concrete Addison Wesley 1999.

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B.TECH. CIVIL ENGINEERING

Sem: III	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BCV3P10	Concrete Technology Lab	
Examination Scheme – Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments:

1) The practical are based on theory subject of Concrete technology and CO's.
2) Minimum eight practical shall be performed from list of experiments.
3) Any one practical may be performed using virtual lab.

Exp. No.	List of Experiments
1	To determine the normal consistency and initial setting time and final setting time by Vicat's apparatus.
2	To determine the fineness of cement.
3	To perform soundness test of cement.
4	To determine fineness modulus for coarse and fine aggregates.
5	To determine the bulking of sand.
6	To determine the compressive strength of cement.
7	To design the concrete mix of required characteristic strength according to I.S. method.
8	To determine the workability of concrete by slump cone, Vee bee apparatus, compaction factor and flow test.
9	To prepare and test the concrete cubes for compressive strength by Indian standard method.
10	Study and performance of various Non-Destructive testing methods (NDT) in concrete technology
11	To determine workability of cement mortar.
12	To determine the permeable voids of concrete
13	To determine the permeability of mortar.

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Sem: III	Total Hours Distribution per week	
Total Credit : 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BMD3T11	Computer Programming by Python

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To learn python basic operations and data structures
2	To build applications using python and its libraries

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand and practice python environment and basics of python
2	Write program based on control structures and various data structures
3	Write modular programs using functions and modules
4	Use files as input and output data to programs and graphics

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit 1: Introduction, Data Types and Operators			
Installation and working with Python, Variables and data types in python, Perform computations and create logical statements using Python's operators: Arithmetic, Assignment, Comparison, Logical, Membership, Identity, Bitwise operators, list, tuple and string operations	6		1
Unit 2: Python Decision making and Loops			
Write conditional statements using If statement, if ...else statement, elif statement and Boolean expressions, While loop, For loop, Nested Loop, Infinite loop, Break statement, Continue statement, Pass statement, Use for and while loops along with useful built-in functions to iterate over and manipulate lists, sets, and dictionaries. Plotting data, Programs using decision making and loops.	6		2
Unit 3: Python Functions and Modules			
Defining custom functions, Organising Python codes using functions, Create and reference variables using the appropriate scope, Basic skills for working	6		3

with lists, tuples, work with dates and times, get started with dictionaries, Importing own module as well as external modules, Programming using functions, modules and external packages			
Unit 4: File Operations & Graphics			
An introduction to file I/O, use text files, use CSV files, use binary files, Introduction to matplotlib.pyplot, plotting text, values, lines, markers, axes, circles, polygones, arrows.	6		4

Text/Reference Books:

1) John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2) Python Programming Fundamentals- A Beginner's Handbook by Nischay kumar Hegde
3) Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication
4) Introduction to Python for Engineers and Scientists, By. Sandeep Nagar, Apress
5) MicroPython for the Internet of Things (A Beginner's guide to programming with Python on microcontrollers) By. Charles Bell, Apress
6) Python for Civil and Structural Engineers: Vittorio Lora, Independently published, 2019.
7) Python Programming Using Problem Solving Approach: Reema Thareja, Oxford University, Press; First edition.
8) Learning Python: Powerful object-oriented programming, Mark Lutz, O'REILLY publications 5th addition.
9) Introduction to Computing & Problem Solving with Python Jeeva Jose and P Sojan Lal Ascher.
10) Problem Solving with Algorithms and Data Structures using Python by Brad Miller and David Ranum, 2nd addition.
11) Allen Downey, Jeffrey Elkner, Chris Meyers, Learning with Python, Dreamtech Press
12) David M. Baezly "Python Cookbook" O'Reilly Media; Third edition, 2013.

Online Learning Platform

1. **Swayam**: Programming in Python https://onlinecourses.swayam2.ac.in/cec23_cs14/preview
2. **Coursera**: Programming for Everybody (Getting Started with Python) https://www.coursera.org/learn/python?specialization=python
3. **edX**: The University of Michigan: Programming for Everybody (Getting Started with Python)

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B.TECH. CIVIL ENGINEERING

Sem: III	Total Hours Distribution per week	
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BOE3T01	Open Elective - I
Examination Scheme		
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

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Sem: III	Total Hours Distribution per week	
Total Credit :1	Practical (P): 2 Hrs.	
Subject Code	BOE3P01	Open Elective - I Lab
Examination Scheme – Practical		
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

NOTE: For BOE3T01and BOE3P01, refer OE Basket <u>other than</u> OE offered by Civil Engg Board

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Sem: III	Total Hours Distribution per week	
Total Credit : 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BHM3T01	Entrepreneurship in Civil Engineering

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To learn concepts of entrepreneurship and startups
2	To explore funding and leanings from case studies.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand a know-how on entrepreneurship development
2	Acquire the knowledge of various types of startups
3	Understand the concept of ideation
4	Apply knowledge for the funding for startups

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit 1: Introduction to Entrepreneurship			
Concept of entrepreneurship, characteristics of an Entrepreneur, types of Entrepreneurship, Functions of Entrepreneurs, Women entrepreneurship in India, Problems and challenges of women entrepreneurs, Government's support system to develop women entrepreneurship.	6		1
Unit 2: Basics of Startups			
Concept of startup, Types of startups: Scalable startup, small business startup, lifestyle startup, buyable startup, social startup, big business startup, Startup ecosystem	6		2
Unit 3: Ideations			
Concept of ideation, ideation process, idea incubation, design thinking approach, ideation techniques (brainstorming, sketching, SCAMPER, and prototyping), success factors for ideation.	6		3

Unit 4: Funding			
Funding for startups, angel funding, venture funding, difference between angel and venture funding, private equity fund, ownership of startups, causes of startups failures, Startup success case studies: Instagram, Linkedin, Snapchat, Whatsapp	6		4

Text/Reference Books:

1. Entrepreneurial Development By, S. S. Khanka S. Chand & Co. Ltd. New Delhi, 1999.
2. Entrepreneurial Development. By, S.Anil Kumar. New Age International.
3. Small- Scale Industries and Entrepreneurship, By, Dr. Vasant Desai, Himalaya Publication.
4. Industrial Economics and Entrepreneurship development by A.M. Sheikh, Nawaz Khan & M.A. Tongo, S Chand Publication

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: III	Total Hours Distribution per week	
Total Credit : 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BVE3T01	Constitution of India
Examination Scheme		
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To provide engineering students with a foundational understanding of the Indian Constitution, its principles, and its relevance to their professional and civic responsibilities

Course Outcomes	
After completion of syllabus, students would be able to	
1	Analyze the basic structure of Indian Constitution.
2	Remember the Fundamental rights and duties.
3	Know DPSP's and Nation's political structure.
4	Understand function of Parliament and Judiciary.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit 1			
Introduction to the Indian Constitution, Preamble of the Indian Constitution and key concepts, Salient features of the Indian Constitution, Role and objective of Constituent Assembly.	6		1
Unit 2			
Fundamental rights meaning, significance, restrictions and limitations Fundamental duties and its scope, difference between Fundamental rights and Fundamental duties	6		2
Unit 3			
Directive Principles of State Policy (DPSP's) and its present relevance in India, Union Executive- President, Prime Minister and Union cabinet.	6		3
Unit 4			
Parliament - role and function, Lok Sabha and Rajya Sabha, Judiciary system	6		4

in India, Supreme Court of India and other courts.			

Text/Reference Books:

1. Introduction to the Constitution of India by D D Basu.
2. Outlines of Indian Legal and Constitutional History by M P Jain.
3. Constitution of India by P M Bakshi

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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: III	Total Hours Distribution per week		
Total Credit :2	Practical (P): 4 Hrs.		
Subject Code	BCE3P01	Community Project/Mini Project	
Examination Scheme – Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
50 Marks	50 Marks	50 Marks	--

Course Outcomes	
After completion of syllabus, students would be able to	
1	To identify the specific challenges and requirements of the community/technical problem related to civil engineering by using comprehensive needs assessment.
2	To involve active participation from community/construction industry members in the planning, decision-making, and implementation processes.
3	To develop capacity building, skill development, and the establishment of local resources by development of projects which focus on long-term solutions that can be sustained by the community/construction industry even after the project ends.
4	To make Successful community /technical development projects often require collaboration between the community, local organizations, NGOs, government agencies, Construction Industry and other stakeholders.
5	To ensure its effectiveness and make any necessary adjustments by using Monitoring and evaluating the project's progress and its impact on community/construction industry.

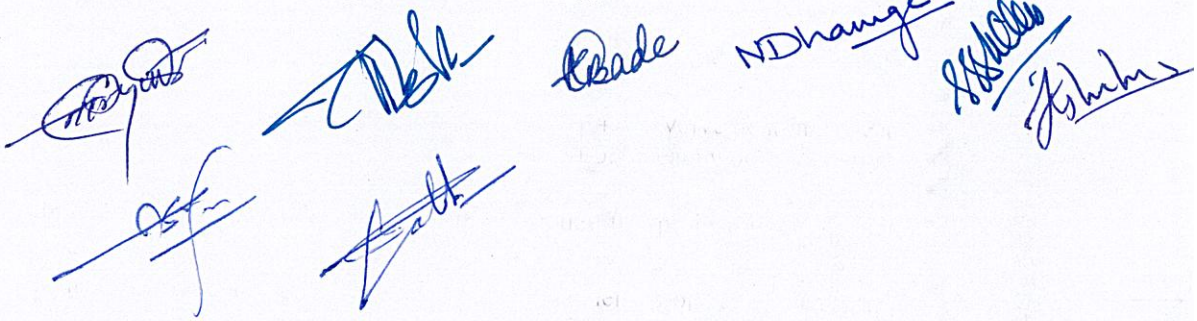
Following guidelines may be used for the Community/mini-project.

- Project allotment should be done at the end of 2nd semester.
- After allotment of guide, student have to identify the problem/issue from Community/Construction Industry by comprehensive assessment of problem/issue.
- Industry person/community person experience greater than 10 years may be Co guide.
- Minium Three students and maximum six students should be in a one group.
- Throughout the 3rd semester session, two Progress seminars are expected from each group namely; Introductory Project Seminar and Project Progress Seminar.
- Before last teaching day of session, Civil Engineering Department have to conduct Exhibition/Demonstration for all groups.
- Internal Assessment as per Below table

Sr. No.	Activity	Max Marks	Total marks	Expected	Assessment
1	Introduction seminar	10	50	Title finalization	Problem & its comprehensive study, problen identification method.
2	Project Progress Seminar	10		Progress of project	1. Procedure/methedology adopted 2. Presentation skill 3. Knowledge of Project
3	Exhibition/Demo	30			

	nstration				4. Involvement in Project 5. Team work

- After completion of project all students groups must submit the project report in spiral binding as per the prescribed format.
- If any group has to present/ publish paper related to their project at National or International.(It is an optional) But at the time of external examination, Examiner can give marks on their published work.
- After completion of project all students groups must submit the project report in spiral binding as per the standard format.
- If any Change of Guide then department have to produce justified reasons to external examiner.
- External Examination will be in terms of presentation/viva voce.



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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: IV	Total Hours Distribution per week	
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BCV4T12	Structural Analysis
Examination Scheme		
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To study basic concepts of analysis of structural components.
2	To undestand structural response.
3	To study various methods of the analysis for determinate and indeterminate structure.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Analyse the continuous beam with and without sinking of support, by Three Moment Theorem.
2	Apply the Moment Distribution Method / Slope and deflection method to analyze indeterminate structures.
3	Draw influence line diagrams for different structures to analyze structural behavior.
4	Apply the Stiffness Matrix Method to analyze complex structures.
5	Analysis the columns and Arches.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit 1: Statically Indeterminate Structures			
Introduction to Statically indeterminate Structures, Concept of Static indeterminacy. Analysis of Fixed and Continuous beams by Three moment theorem, effects of sinking of support.	7		1
UNIT II: ANALYSIS OF BEAMS AND FRAMES			
Analysis of Continuous Beams and Portal frames by Slope Deflection Method. Analysis of Continuous Beams and Simple Portal frames (Sway and Non Sway) Using Moment Distribution Method.	7		2
UNIT III: INFLUENCE LINE DIAGRAM			
Rolling loads on simply supported beams with concentrated and uniformly	7		3

distributed loads, maximum B.M. and S.F. Influence Line Diagrams for Reactions, Shear Forces and Bending Moments in simply supported beam, cantilevers and beams with overhangs, ILD for forces in members of Simple Truss.			
UNIT IV: MATRIX STIFFNESS METHOD - APPLICATION TO BEAMS AND PLANE FRAMES			
Basic concept, degree of freedom, direct stiffness Method. Formulation of elemental/local stiffness matrix and global stiffness matrix for beam members (without axial deformation), for plane frame members. Member load matrix due to concentrated loads, uniformly distributed loads. Transformation matrix, Assembly of global/structural load matrix up-to three elements. Solution to problems with maximum degree of freedom three.	6		4
UNIT V: COLUMN AND TWO-HINGED ARCHES			
Columns : Bucking of columns, Euler's and Rankine's formula, Two-Hinged Arches: Secant Formula Analysis of Two-Hinged Arches S.F. and normal thrust, parabolic arches.	6		4

List of Books:

- Structural Analysis –I, Fourth Edition, S. S. Bhavikatti, Vikas Publishing house Pvt. Ltd.
- Structural Analysis –II, Fourth Edition, S. S. Bhavikatti, Vikas Publishing house Pvt. Ltd.
- Basic Structural Analysis, Second Edition, C. S. Reddy, Mc Graw-Hill India.
- Basic Structural Analysis, Third Edition, C. S. Reddy, Mc Graw-Hill India.
- Structural Analysis - A Matrix method, Second Edition, G. S. Pandit & S. P. Gupta, Mc Graw-Hill.
- Advanced Structural Analysis, Devdas Menon, Narosa Publishing House, New Delhi.
- Structural Analysis, R. C. Hibbeler, Sixth Edition, Pearson.
- Theory of Structure, R.S. Khurmi & N. Khurmi, S-Chand Publication.

Reference Book:

- Theory of Structure, S. Ramamurtham, R. Narayanan, Eleventh Edition, Dhanpat Rai Publishing Company.
- Theory and Analysis of Structures, Volume – 1, O.P. Jain & B.K. Jain, Third Edition, Nem Chand Brothers.
- Theory of Structures, Timoshenko S. P. & Young D.H., International Edition, McGraw-Hill.
- Intermediate Structural Analysis, C. K. Wang, Indian Edition, McGraw-Hill.

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B.TECH. CIVIL ENGINEERING

Sem: IV	Total Hours Distribution per week		
Total Credit :1	Practical (P): 2 Hrs.		
Subject Code	BCV4P12	Structural Analysis Lab	
Examination Scheme – Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
50 Marks	25 Marks	25 Marks	--

List of Experiments:

a) The practicals are based on theory subject of Structural Analysis and CO's.
b) Minimum eight practicals shall be performed from list of experiments.
c) Any one practical may be performed using virtual lab.

Exp. No.	List of Experiments
1	Verification of Maxwell's reciprocal theorem using simply supported beam.
2	Verification of Maxwell's reciprocal theorem using simply supported truss.
3	Horizontal thrust in two hinged arch.
4	ILD for Horizontal thrust in two hinged arch.
5	Verification of flexural rigidity using simply supported beam.
6	Analysis of a continuous beam using computer software.
7	Analysis of a plane frame using computer software.
8	Study practical on strain gauge.
9	Comparison of different types of column buckling load.
10	Horizontal thrust in portal frame.
11	Introduction of different method of structural analysis.
12	To determine the deflection of two Span Continuous beam.

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B.TECH. CIVIL ENGINEERING

Sem: IV	Total Hours Distribution per week	
Total Credit : 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BCV4T13	Geotechnical Engineering
Examination Scheme		
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	Imparting knowledge about index properties and their determination.
2	Analyzing significance of permeability and seepage in soil.
3	Understanding the concept of consolidation and its significance in soil mechanics.
4	Evaluating the role of compaction in improving soil stability and load-bearing capacity.
5	Estimate the compressibility potential and analyze shear strength parameters.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Determine basic properties and index properties of soil using knowledge of engineering mechanics and hydraulics.
2	Construct and analyze principles of permeability and seepage in soil mechanics.
3	Explain the fundamental principles of soil consolidation and its significance in geotechnical engineering.
4	Evaluate hydraulic properties and compaction of soil, identify the soil classification,
5	Explain the significance of shear strength in soil stability and geotechnical engineering applications.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit 1: Introduction, Physical & Index properties of soil:			
Introduction: Origin sand formation of soil, Various soil weight & volume inter-relationship. Physical & Index properties of soil: Weight- Volume Relationships, Insitu Density, Moisture Content, Specific Gravity, Relative Density, Atterberg's Limits, Soil Indices, consistency of soil, Particle Size Distribution of soil: Sieving, Sedimentation Analysis, Identification & Classification of soil: Field identification of soil, Soil Classification: as per Unified Classification System,	9		1

IS Code Recommendation, AASHTO Classification			
Unit 2: Permeability and Seepage			
Flow through soil: Darcy's Law, Coefficient of permeability, laboratory and field determination of coefficient of permeability, Permeability for Stratified Deposits, Laplace's Equations, Flow nets, Flow Through Earthen Dam, Estimation of Seepage, Uplift due to seepage. Effective Stress Principles: Effective Stress, Effective pressure due to different conditions, Seepage force, Critical hydraulic gradient, Quick sand condition.	7		2
Unit 3: Consolidation			
Consolidation of soil: Introduction, types of clay deposits, initial, primary & secondary consolidation, spring analogy for primary consolidation, one dimensional consolidation test results, Terzaghi's theory of consolidation.	5		3
Unit 4: Compaction			
Compaction: Mechanism of compaction, factors affecting compaction. Standard & modified proctor Tests, field compaction equipments, quality control.	5		4
Unit 5: Shear Strength			
Shear Strength of Soil: Basic concepts, Mohr- Columb's Theory, Laboratory Determination of soil shear parameter- Direct Shear, Tri-axial Test, Unconfined Compression, Vane Shear Test, Sensitivity & thixotropy of clay.	7		5

Text/Reference Books:

1. Soil Mechanics & Foundation Engg, B.C.Punmia, Laxmi Publication.
2. Text book of Soil Mechanics & Foundation Engineering, V.N.S. Murthy, CBS Publisher's & Distributors.
3. Geotechnical Engineering – Principles and Practice, Coduto, Pearson Education.
4. Soil Mechanics, Lambe & Whitman, WIE.
5. Basic & Applied Soil Mechanics, Gopal Ranjan & A.S.R.Rao, Willes Eastern Ltd.
6. Soil Mechanics & Foundation Engg, K.R. Arora, Std. Publisher.
7. Soil Mechanics & Foundation Engg, Modi, Std. Publisher.

Online Learning Platform

4. **Swayam**: Geotechnical Engineering I
https://swayamprabha.gov.in/index.php/program_data/data/12
5. **Class central**: Soil Mechanics
https://www.classcentral.com/subject/geotechnical-engineering

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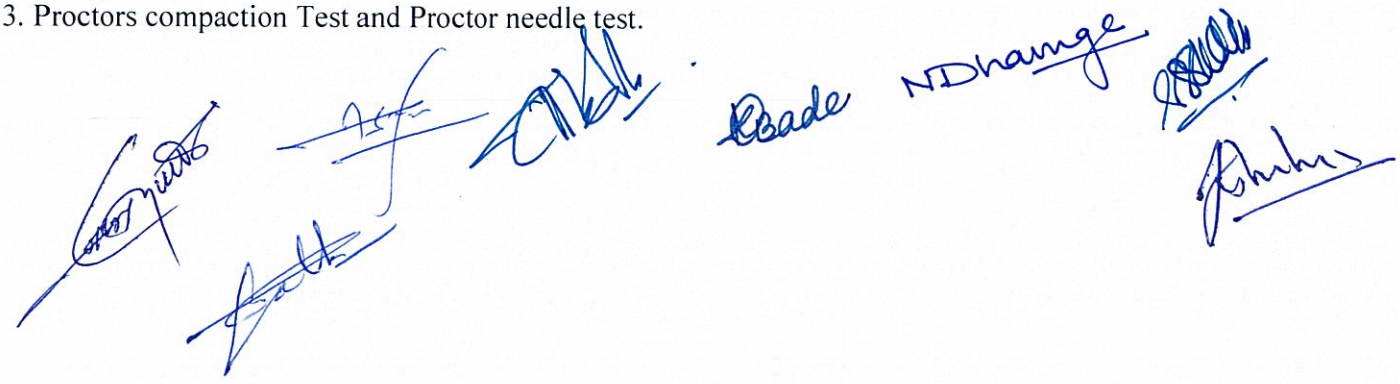
B.TECH. CIVIL ENGINEERING

Sem: IV	Total Hours Distribution per week		
Total Credit : 1	Practical (P): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BCV4P13	Geotechnical Engineering	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments : Any 8

1. Moisture content and Specific gravity of soil.
2. Grain size Analysis – (Sieve Analysis).
3. Consistency limit, plastic limit and liquid limit of soil.
4. Hydrometer Analysis.
5. Constant Head Permeability test of or Falling Head Permeability test.
6. Consistency limit of soil (shrinkage limit).
7. Field Density by sand replacement method.
8. Field Density by core cutter method.
9. Unconfined compression test.
10. Direct shear Test.
11. Triaxial shear test (Demonstration).
12. Study of Plate load Test.
13. Proctors compaction Test and Proctor needle test.



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FACULTY OF SCIENCE & TECHNOLOGY
B.TECH. CIVIL ENGINEERING

Sem: IV	Total Hours Distribution per week	
Total Credit : 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BMD4T14	Artificial Neural Networks

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To learn intelligence systems and knowledge based systems and networks

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand and practice python environment and basics of python
2	Write modular programs using functions and modules
3	Use feed back and feed forward
4	Learn to develop civil engineering applications using ANN, associate=ive memory and self organizing maps.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit 1: Introduction to Artificial Neural Networks			
Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between them and the Computer, Comparison Between Artificial and Biological Neural Network Basic Building Blocks of Artificial Neural Networks, Artificial Neural Network (ANN) terminologies.	6		1
Unit 2: Fundamental Models of Artificial Neural Networks			
Introduction, McCulloch – Pitts Neuron Model, Learning Rules, Hebbian Learning Rule Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Least Mean Square (LMS) Rule,Competitive Learning Rule, Out Star Learning, Boltzmann Based Learning, Hebb Net. Perceptron Networks: Introduction, Single Layer Perceptron, Brief Introduction to Multilayer Perceptron Networks.	6		2
Unit 3: Networks			
Feedback Networks: Introduction, Discrete Hopfiled Net, Continuous	6		3

Hopfiled Net, Relation between BAM and Hopfiled Nets. **Feed Forward Networks**: Introduction, Back Propagation Network (BPN), Radial Basis Function Network (RBFN).			
Unit 4: Associative Memory Networks			
Introduction, Algorithms for Pattern Association, Hetero Associative Memory Neural Networks, Auto Associative Memory Network, Bi- directional Associative Memory. Self Organizing Feature Map: Introduction, Methods Used for Determining the Winner, Kohonen Self Organizing Feature Maps	6		4

Text/Reference Books:

1. Simon Haykin, "Neural networks A comprehensive foundations", 2nd ed., Pearson Education, 2004.
2. B Yegnanarayana, "Artificial neural networks", 1st ed., Prentice Hall of India P Ltd, 2005.
3. Li Min Fu, "Neural networks in Computer intelligence", 1st ed., TMH, 2003.

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B.TECH. CIVIL ENGINEERING

Sem: IV	Total Hours Distribution per week	
Total Credit : 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BOE4T02	Open Elective - II
Examination Scheme		
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

NOTE: For BOE4T02, refer OE Basket other than OE offered by Civil Engg Board

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B.TECH. CIVIL ENGINEERING

Sem: IV	Total Hours Distribution per week	
Total Credit : 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BHM4T02	Construction Planning and Management

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To provide engineering students with a foundational understanding of Construction Planning and Management

Course Outcomes	
After completion of syllabus, students would be able to	
1	To understand the role of stakeholders in construction management & economy
2	To understand the job layout labour wages ,accidents & safety measure in construction
3	To understand the methods of network techniques such as Critical Pathe Method (CPM), Cost optimization in CPM and to updating for construction and management.
4	To understand Resources planning, allocation and scheduling and Programme Evaluation And Review Technique (PERT)

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit 1			
CONSTRUCTION MANAGEMENT AND ECONOMY Need for construction management, Scope of construction management. Aspect of construction management, PHASES of project or construction management, Engineer and construction economy Contractor and construction economy, Construction cost, Cost control records, Cost index or price index, Construction cost control, Planning the project, Financing the project, Project Management Triangle, Project management activities, Stages in construction, Work breakdown structure. **MANAGERIAL ORGANIZATION** Levels of management, Functions of management, Qualities of a good entrepreneur, Construction project Manager, Characteristics of a good	6		1

manager, Qualifications of an administrator, Conditions essential for carrying on business, Meaning of organization, Forms of business organization, Principles of organization, Systems of staff organization, Organization of a construction company, Office management, Personnel management, Office discipline.			
Unit 2			
JOB LAYOUT AND PROJECT SUPERVISION Job layout, General principles for Job layout, Factors governing Job layout, Advantages of Job layout, Preparation of Job layout, Project supervision, Project control, Project evaluation, Construction camp **CONSTRUCTION ACCIDENTS AND SAFETY MEASURES** Importance of Safety in Construction Projects, Causes of construction accidents, Classification of construction accidents, Injury-frequency rate, Injury-severity rate, Injury-index, Equivalent time charge, Compensation insurance, Accident cost, Safety programme in construction projects, Rules for preventing construction accidents, Safety Precautions for Different Items of Construction, Safety Precautions For Foundation and Excavation, Safety Precautions For Brickwork, Concrete Work, Concrete Work in Cold Weather, Concrete Work in Hot Weather, Form Work, Scaffolding , Shoring , Underpinning, Steel Structures, Construction of Multi-Storeyed Buildings, hot Bituminous Work, Demolition work,. Storage of Materials, Tunnel Construction. **CONSTRUCTION LABOUR** Immobility of labour, Theories of wages, Nominal wages and real wages, Psychic income, Systems of wage payments, Incentive plans, Group incentive plans, Payment by result, Profit-sharing, Morale Measurement of moral, Trade unions, Labour welfare, Indian labour	6		2
Unit 3			
CONVENTIONAL METHODS OF MANAGEMENT TECHNIQUES Gantt or Bar charts, Mile-Stone Charts, Line of Balance (Lob) Technique **INTRODUCTION TO NETWORK TECHNIQUES** Features of network planning, Elements of Network Diagram, Rules for Preparing Network Diagram Rules for network diagram, Fulkerson's Rule for Numbering the Events, Types of Network Diagram, Arrow diagram or Activity-On-Arrow (AOA) diagram, Circle diagram or Activity-On-Node (AON) diagram, Typical problems on network diagram. **NETWORK TECHNIQUES: CRITICAL PATH METHOD (CPM)** Introduction of CPM, Uses of CPM, Advantages of CPM, Application of CPM in project management for determining extension of time, Difficulties in implementation of the CPM, Activity Duration Time (t), Earliest occurrence time (TE) for event, Latest occurrence time (TL) for event, Start and Finish Times for activity. **FLOATS:** Significance of floats, Critical path and scheduling, typical problems on critical path method (CPM) **COST OPTIMIZATION IN CRITICAL PATH METHOD (CPM)**	6		3

Utility data with respect to time and cost, Project cost, Cost-time optimization Cost slope, Cost Optimization by crashing, Time-grid diagram, Typical problems on cost optimization. **UPDATING NETWORK DIAGRAM FOR CPM CONSTRUCTION PLANNING AND MANAGEMENT DETAILED CONTENTS** Necessity of Updating, Steps for Updating, Typical Problems on Updating Network Diagram for CPM			
Unit 4			
RESOURCES PLANNING, ALLOCATION AND SCHEDULING Resources planning, Resources allocation, Resource scheduling, typical problems on resources planning, allocation and scheduling **PROGRAMME EVALUATION AND REVIEW TECHNIQUE (PERT)** Programme Evaluation and Review Technique (PERT), Terminology Used in PERT, Percentage of probability, Implementing PERT, PERT network scheduling, Slacks of events, Negative slack and negative float, Typical problems on PERT, Selection of technique	6		4

Text/Reference Books:

1. Construction Planning and Management by K.S. Rangwala Charotar Publishing

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Sem: IV	Total Hours Distribution per week	
Total Credit: 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BVE4T02	Environmental Science

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

Course Objectives	
1	To understand the fundamentals of environmental science and its relevance in civil engineering.
2	To introduce concepts of sustainable development
3	To study water resource management.
4	To create awareness of environmental laws and policies.

Course Outcomes	
After completion of syllabus, students would be able to	
1	Understand the fundamentals of environmental science
2	Apply sustainable development principles in civil engineering
3	Demonstrate knowledge of water resource management
4	Interpret environmental laws and policies

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit I: Introduction to Environmental Science	6	-	1
• Definition, Scope, and Importance • Components of Environment: Atmosphere, Hydrosphere, Lithosphere, and Biosphere • Role of Civil Engineers in Environmental Protection • Man-Environment Relationship and Need for Sustainability			
Unit II: Sustainable Development	6	-	2

• Concept of Sustainable Development in Civil Engineering • Green Building Concepts, LEED Certification • Solid and Hazardous Waste Management: Collection, Treatment, and Disposal • Environmental Impact Assessment (EIA): Methods and Case Studies • Life Cycle Assessment (LCA) in Civil Engineering			
Unit III: Water Resource Management	6	-	3
• Sources of Water: Surface and Groundwater • Rainwater Harvesting and Watershed Management • Wastewater Treatment Technologies: Primary, Secondary & Tertiary Treatment			
Unit IV: Environmental Policies, Laws & Regulations	6	-	4
• Environmental Protection Act, 1986 • Water (Prevention and Control of Pollution) Act, 1974 • Air (Prevention and Control of Pollution) Act, 1981 • Role of Pollution Control Boards • International Agreements: Kyoto Protocol, Paris Agreement			

Text/Reference Books:

1. "Environmental Science and Engineering" – Suresh K. Dhameja
2. "Environmental Engineering" – Peavy, Rowe, and Tchobanoglous
3. "Environmental Studies" – R. Rajagopalan
4. "Waste Management and Environmental Sustainability" – S. Ramachandra Rao
5. "Introduction to Environmental Engineering" – Mackenzie L. Davis and David A. Cornwell

Online Learning Platform:

1. NPTEL (National Programme on Technology Enhanced Learning)
Website: https://nptel.ac.in
2. SWAYAM (Study Webs of Active Learning for Young Aspiring Minds)
Website: https://swayam.gov.in

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B. Tech. CIVIL ENGINEERING

Sem: IV	Total Hours Distribution per week		
Total Credit: 2	Practical (P): 4 Hrs.		
Course Code	BVS4P02	Building Design and Drawing Lab	
Examination Scheme- Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
50 Marks	50 Marks	50 Marks	--

Practical Course Objectives	
1	To impart basic knowledge and skills of drafting software AUTOCAD (2D)
2	To impart knowledge of basic principles of building planning.

Practical Course Outcomes	
After completion of the practical course, students would be able to	
1	Sketch various components of a building using basic commands of AutoCAD.
2	Paraphrase basic principles of planning of a building.
3	Draft submission drawings of single-storied and multi-storied buildings using AutoCAD.

List of Practical

Pr. No.	List of Practical	Mapped with CO
1	Introduction to AutoCAD (2D) drafting software and its basic commands.	CO1
2	Exercise on Draw, Modify, Annotation and Layer tool bars.	CO1
3	Drafting of Brick masonry bonds and section through wall using AutoCAD.	CO1
4	Drawing of building components like stair, staircase, doors, and Windows using AutoCAD.	CO1
5	Study of Principles of Building Planning and Building bye Laws (UDCPR).	CO2
6	Planning of a single storied residential building with R.C.C. flat roof and drawing of its submission drawing using AutoCAD.	CO2 & CO3
7	Planning of a multi storied residential building with R.C.C. flat roof and drawing of its submission drawing using AutoCAD.	CO2 & CO3
8	Drawing of double line plan, front elevation and section of a multistorey Public Building using AutoCAD.	CO3

Text/ Reference Books:

1. Vishnu Priya Singh, "AutoCAD 2019 – Simplest Book for Learning for Engineers and

Designers" ISBN: 978-81-931622-8-6.
2. M. G. Shah, C. M. Kale, S. Y. Patki (2012), "Building Drawing with an Integrated Approach to Built Environment", Tata McGraw-Hill Education.
3. M. Chakraborti (2017), "Civil Engineering Drawing (including Architectural aspect)", Monojit Chakraborti Publications, Kolkata **Online Learning Platform.**
4. National Building Code (NBC 2016)
5. Unified Development Control and Promotion Regulations for Maharashtra State (UDCPR January 30, 2025)

OPEN ELECTIVE OFFERED BY CIVIL ENGINEERING BOS

(Students of Civil Engineering will not be able to opt these OE courses)

S.NO	SEMESTER	COURSE CODE	COURSE NAME
1	3rd sem	BOE3T01	Building Construction Materials and Practices
2	4th sem	BOE4T02	Environmental Management

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Sem: III	Total Hours Distribution per week		
Total Credit: 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BOE3T01	Open Elective – I Building Construction Materials and Practices	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

	Course Objectives
1	To prepare the students to understand components of buildings and their functions.
2	To learn about various building materials and their execution.
3	To study the necessity and behavior of foundations in construction.
4	To explore innovative solutions for sustainable and eco-friendly construction.
5	To understand the composition, properties, and mix design techniques of concrete, enabling the selection and optimization of materials.

	Course Outcomes
	After completion of syllabus, students would be able to
1	Identify and describe the components of a building.
2	Differentiate and classify various building materials.
3	Select suitable materials for construction projects.
4	Analyze different types of foundations and structural systems.
5	Apply knowledge of concrete ingredients, properties, and mix design techniques to optimize workability, strength, and durability.

SYLLABUS

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
UNIT 1			
Stones- Types of Stones, Requirements of Good Building Stones, Dressing of stones, Deterioration and Preservation of Stone Work.	2		1
Bricks - Classifications, Manufacturing of Clay Bricks, Requirements of Good Bricks.	2		

Alternative bricks (fly ash bricks, AAC blocks)	1		
Lime- Classification, Properties.	1		
UNIT 2			
Doors, Windows and Ventilation- Location of Doors and Windows, Technical Terms, Material for Door and Windows	2		2
Fire-resistant doors and windows Prefabricated and modular construction techniques Advanced scaffolding systems and safety measures	2		
Form Work- Introduction to Formwork, Scaffolding	2		
UNIT 3			
Foundation-Introduction, Necessity of Foundation, Causes of failure of Foundations and Remedial Measures.	2		3
Soil stabilization techniques &Underpinning methods for foundation repair	2		
Types of Structure- Load Bearing Structures and Framed Structures.	2		
UNIT 4			
Wall Finishes, Plastering, Paintings, Purposes, Methods, Defects and their Solution, Glass- Types and Uses	3		4
Green building materials and finishes& Smart coatings and self-healing materials	3		
UNIT 5			
Ingredients of concrete – Cement, Aggregates, Water, and Admixtures.	3		5
Workability, strength, and durability properties of concrete. Mix design techniques – nominal mix and design mix.	3		

Reference Books:

1. Building Construction by Rangwala.
2. Building Construction & Construction Materials by G. S. Birde& T. D. Ahuja.
3. Building Construction by Arun Kr. Jain Ashok Kr. Jain & B. C. Punmia.
4. Building Construction by Gurucharan Singh.

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Sem: III	Total Hours Distribution per week		
Total Credit : 1	Practical (P): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.	
Subject Code	BOE3P01	Open Elective – I Building Construction Materials and Practices Lab	
Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
25 Marks	25 Marks	25 Marks	--

List of Experiments: Any 08

1. Identification of Stones & Bricks – Study of different types of stones and bricks used in construction.
2. Brick Testing – Conducting tests such as water absorption, compressive strength, and efflorescence.
3. Lime and Cement Tests – Identification of lime and its properties; consistency and setting time tests of cement.
4. Analysis of Doors and Windows – Study of different types of doors and windows used in modern construction.
5. Formwork and Scaffolding – Demonstration of various formwork and scaffolding systems.
6. Soil Bearing Capacity Test – Field determination of soil bearing capacity for foundation design.
7. Plastering & Painting Techniques – Demonstration of different plastering and painting methods, including defect analysis.
8. Glass Identification & Applications – Study of different types of glass and their uses in construction.
9. Green Building Practices – Case study on sustainable and eco-friendly construction materials.
10. Study of Earthquake tips– Understanding the design principles of earthquake-resistant buildings.

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Sem: IV	Total Hours Distribution per week	
Total Credit : 2	Lecture (L): 2 Hrs	Tutorial/Activity (T/A): 0 Hr.
Subject Code	BOE4T02	Open Elective – II (Environmental Management)

Examination Scheme			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
30 Marks	70 Marks	45 Marks	3 Hours

	Course Objectives
1	To equip individuals with the knowledge of Environmental pollution and its control
2	To understand the fundamentals of Climate change
3	To promote sustainable practices.
4	To create awareness of environmental Conservation

	Course Outcomes
After completion of syllabus, students would be able to	
1	Understand environmental pollution and its control measures.
2	Acquire knowledge of various environmental challenges
3	Understand the concept of sustainable development
4	Know the role of individuals in environmental protection

Syllabus

Details of Topic	Allotment of Hours		Mapped with CO Number
	L	T/A	CO
Unit I: Introduction to Environmental Pollution and Control	6	-	1
Introduction to Pollution: Air, Water, Land, and Noise – Causes, Effects, and Control Measures Plastic Pollution: Causes, Effects, and Control Measures Municipal Solid Waste: Definition, Composition, Effects and Control Measures Electronic Waste: Definition, Composition, Effects and Control Measures			
Unit II: Climate Change and Environmental Challenges	6	-	2

Global Warming and the Greenhouse Effect – Causes, Consequences, and Mitigation Strategies Ozone Layer Depletion – Causes, Impacts on the Environment and Human Health, and Protective Measures Acid Rain – Formation, Effects on Ecosystems and Infrastructure, and Control Measures Nuclear Hazards – Sources, Environmental and Health Risks, and Safety Regulations			
Unit III: Environmental Sustainability	6	-	3
Overview of Environmental Management and Sustainable Development Significance of Sustainable Development – Need, Benefits, and Long-Term Impact Sustainable Development Goals– Objectives and Global Implications Sustainability Practices – The Three "R" Concept of Waste Management, Water Conservation, and Energy Conservation Carbon Credits: An overview, Purpose, Types and benefits			
Unit IV: Environmental Conservation	6	-	4
Environmental Values and the Impact of Technological Developments on Society and the Environment – Positive and Adverse Effects Contributions to Environmental Conservation – Role of Individuals, Corporations, and Society Case Studies: • Industrial and Chemical Disasters: Bhopal Gas Tragedy • Air and Water Pollution: New Delhi's Air Pollution, Ganga River Pollution • Natural Disasters and Climate Events: Uttarakhand Flash Floods			

Text/Reference Books:

1. "Environmental Management" – N.K. Uberoi
2. "Environmental Science and Engineering" – Suresh K. Dhameja
3. "Environmental Management: Principles and Practice" – John Pallister
4. "Introduction to Environmental Management" – Mary K. Theodore and Louis Theodore
5. "Environmental Management for Sustainable Development" – Chris Barrow
6. "Environmental Impact Assessment" – Larry W. Canter
7. "Environmental Management" – Bala Krishnamoorthy
8. "Industrial Pollution Control and Environmental Management" – A.K. Srivastava
9. "Waste Management Practices: Municipal, Hazardous, and Industrial" – John Pichtel
10. "Environmental Laws and Policies in India" – Kailash Thakur
11. "Climate change and Its Control" – Dr. R.N.Patil, Dr. R. M. Dhoble, Dr. A. Bhambhulkar

Online Learning Platform:

1. NPTEL (National Programme on Technology Enhanced Learning)
Website: https://nptel.ac.in Environmental Impact Assessment, Environmental Management, Sustainable Development

2. SWAYAM (Study Webs of Active Learning for Young Aspiring Minds)
Website: https://swayam.gov.in

3. Climate Literacy and Energy Awareness Network (CLEAN)
Website: https://cleanet.org

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Exit Option / Scheme

With reference to GR/ Notification of Maharashtra Government Higher and technical Education department No. Nep-2022/(67/23)/Tec Edu-2, dated 04/07/2023.

Exit Option after 2nd semester- Students exiting the First Year programme after securing minimum 40 credits will be **awarded UG Certificate** in the relevant Discipline/ Subject provided they secure 8 credits in **work-based vocational course or internship / Apprenticeship** offered during summer vacation in addition to 4 credits from skill-based course earned during the first and second semester.

Sr.	Course Code	Title of Course	Marks	Passing	Credit	Duration
1	BCV2PE1	Computer added Drafting (Auto-cad / Revit)	100	50	2	(26-30hrs /Credits)
2	BCV2PE2	Internship / Mini Project	300	150	6	6 weeks (36-40 hrs/ week)

Note: Student has to take prior approval from HoD for above courses / internship.

Exit Option after 4th semenster - Students exiting the Second Year programme after securing minimum 80 credits will be **awarded UG Diploma** in the relevant Discipline/ Subject provided they secure additional 8 credits in **skill-based vocational courses (skill-based courses, internship, mini projects etc)** offered during summer vacation after the second year.

Sr.	Course Code	Title of Course	Marks	Passing	Credit	Duration
1	BCV4PE3	Computer added Drafting (Auto-cad / Revit) **Or** STAAD Pro/ ETAB / (Software related to Structures)	100	50	2	(26-30hrs /Credits)
2	BCV4PE4	Internship / Mini Project	300	150	6	6 weeks (36-40 hrs/ week)

Note: Student has to take prior approval from HoD for above courses / internship.

Exit Option after 6th Semester - Students exiting the 3 - Year UG program will be **awarded B. Voc.** In the relevant Discipline / Subject upon securing minimum 120 credits with additional 8 credits in **skill-based vocational course (skill-based courses, internship, mini projects etc.)** offered during summer vacation after the sixth semester.

Sr.	Course Code	Title of Course	Marks	Passing	Credit	Duration
1	BCV6PE5	Computer added Drafting (Auto-cad / Revit) **Or** STAAD Pro/ ETAB / (Software related to Structures) **Or** Total station equipment training / course. **Or** Project management and Planning software course	100	50	2	(26-30hrs /Credits)
2	BCV6PE6	Internship / Mini Project	300	150	6	6 weeks (36-40 hrs/ week)

Note: Student has to take prior approval from HoD for above courses / internship.