



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

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)

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 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

Annexure - I

CREDIT FRAME WORK STRUCTURE

Semester		I	II	III	IV	V	VI	VII	VIII	TotalCredits
Basic Science Course	BSC/ESC	3 * 2 =6	4 * 2 =8	--	--	--	--	--	--	14
Engineering Science Course		4 * 2 =8	04	--	--	--	--	--	--	12
Program Core Course (PCC)	Program Courses	--	02	4 * 2 =8	4 * 2 =8	4 * 2 +2 =10	4 * 2 =9	0	4+4=8	44
Program Elective Course (PEC)		--	--	--	--	04	4 * 2 =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		--	--	--	--	--	--	04	--	04
Comm. Engg. Project (CEP)/ Field Project (FP)	Experiential Learning Courses	--	--	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

Annexure - II

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

S N	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
					(Th)	TU	P		Theory				Practical		
									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	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	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	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	ASH	0	0	2	1	--	--	--	--	25	25	25
10	VSC - I	BVS1P01	Construction Workshop Practices	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	

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

S N	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
					(Th)	TU	P		Theory				Practical		
									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	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	ASH			2	1	-	-	-	-	-	50	25
5	ESC– III	BCV2T07	Engineering Mechanics	Civil	3	-	-	3	3	70	30	45	-	-	-
6	ESC– III	BCV2P07	Engineering Mechanics	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		-	-	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						
					(Th)	TU	P		Theory				Practical		
									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	Civil	-	-	2	1	-	-	-	-		50	25
3	PCC-III	BCV3T10	Concrete Technology	Civil	3	-	-	3	3	70	30	45	-	-	-
4	PCC-III	BCE3P10	Concrete Technology	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 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	-	-	-	-	-	100	50
			Total		15	-	10	20		420	180		50	200	

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

SN	Course Category	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
					(Th)	TU	P		Theory				Practical		
									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	Civil	-	-	2	1	-	-	-	-	25	25	25
3	PCC-V	BCV4T13	Geotechnical Engineering	Civil	3	-	-	3	3	70	30	45	-	-	-
4	PCC-V	BCV4P13	Geotechnical Engineering	Civil	-	-	2	1	-	-	-	-	-	50	25
5	MDM-II	BMD4T14	Artificial Neural Network	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 Engg Report Writing	Civil	2	-	-	2	3	70	30	45	-	-	-
8	HSSM-II	BHM4T02	Project 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	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 8 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						
					(Th)	TU	P		Theory				Practical		
									ExamHrs.	SEE	CIE	Min.	SEE	CIE	Min.
1	PCC-VI	BCV5T15	Design of RCC Structure	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	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	Civil	-	-	2	1	-	-	-	-	-	50	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 Refer Program Elective Basket	Civil	-	-	2	1	-	-	-	-	25	25	25
8	MDM-III	BMD5T19	Internet of Things	Civil	3	-	-	3	3	70	30	45	-		-
9	MDM-III	BMD5P19	Internet of Things	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						
					(Th)	TU	P		Theory				Practical		
									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	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 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		-	-	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						
					(Th)	TU	P		Theory				Practical		
									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	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	

#indicates that Online Courses to be done from NPTEL. Examination will be conducted by NPTEL/RTMNU.

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

SN	Course Code	Course Code	Name of Course	BoS	Teaching Scheme (hrs.)			Total Credit	Examination Scheme						
					(Th)	TU	P		Theory				Practical		
									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	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	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 INDIAN KNOWLEDGE SYSTEM COURSES (IKS)
(Offered by Applied Science Board and Humanities)

S.N.	Semester	Category	Course code	Course name
1	2 nd sem	IKS-I	BIK2T01A	Consciousness Studies
2			BIK2T01B	Preserving Art, Culture and Tradition
3			BIK2T01C	Wellness, traditional medicines and yoga
4			BIK2T01D	Glimpses of ancient Science and Technology

Abbreviations: Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Indian Knowledge System: IKS; Value Education Courses: VEC; OJT: On Job Training: Internship/ Apprenticeship.

Field projects: FP; Community engagement project: CEP; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP, Liberal Learning Course: Lib. Learn, Courses on Humanities, Social Science, and Management: HSSM. Semester End Examination: SEE; Continuous Internal Evaluation: CIE

LIST OF PROGRAM ELECTIVE COURSES (PEC) CIVIL ENGINEERING

S.N.	Semester	Category	Course code	Course name
1	5 th sem	PEC-I	BCV5T18A	Advanced Construction Materials
2			BCV5T18B	Advanced Geotechnical Engineering
3			BCV5T18C	Advanced Structural Analysis
4	6 th sem	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	7 th sem	PEC-IV	BCV7T27A#	Retrofitting and Rehabilitation of Civil Infrastructure#
11			BCV7T27B#	Sustainable Materials & Green Buildings#
12			BCV7T27C#	Disaster Recovery and Build Back Better#
13	8 th sem	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	Statics in Hydrology

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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	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, Rajnish Verma, 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: 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 normalization condition, Application to one dimensional infinite potential well.	6		1

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 Mc Graw 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. Devashree Hardas & Dr. Ashish Panat, Das Ganu Publication ISBN-978-81-921757-7-5 (2011)
9. Applied Physics, - Dr. (Mrs) S. P. Wankhede, Dr. Shruti Patle, 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. Shruti Patle, Dr. (Mrs.) S. U. Bhonsule, Dr. Ashish N. Bodhaye, Dr. Manohar D. 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.		
Subject Code	BCV1P02	Applied Physics	
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	BCVE1T03	Name of Subject: Engineering Graphics	
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 of Residential 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	
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 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

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 basic 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 and 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, New Delhi
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. Shah P.J,(2012),“Basics of Engineering Graphics”, S. Chand, NewDelhi
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 vastushastra is to have better life.
2	The whole purpose of vastushastra 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.

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 room, Furniture making, Doors, Windows and ventilators, Main Entrance,	8		3

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 NarendraHariSahasrabuddhe.
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): 1 Hrs	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 Don'ts of Public speaking	4		3

UNIT 4 Remedial Vaastu			
Reading Skills: Importance of reading skills, Types of reading, comprehending 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 Lalita Bisen, Bhumika Agrawal, N. Thejo Kalyani, 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	
Examination Scheme - Practical			
Internal Marks:	University Marks:	Minimum Passing 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, Bhumiika Agrawal, N.Thejo Kalyani, 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	
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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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, Runge kutta method of 4 th order, Milne's Predictor-Corrector method, Runge Kutta 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, Rajnish Verma, 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	
Examination Scheme - Practical			
Internal Marks:	University Marks:	MinimumPassing 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 PRACTICALS: Performance of at least **SIX** practical is compulsory in a semester.

Pr. No.	List of Practicals
	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): 3 Hrs	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	Analyze 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 Number
	L	T/A	CO
Unit-1: Electrochemistry and Corrosion Technology			1
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 dye sensitized solar cells.	4		
B] Corrosion: Theories of Corrosion (Dry, Wet and Differential Aeration), Pilling-Bedworth Rule & Numerical, Factors affecting corrosion, Types of	3		

Corrosion (Intergranular & Stress), Corrosion Protection- Design & Material Selection, Cathodic Protection (Galvanic & Impressed Current)			
Unit-2: Fuels & Lubricants			
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;	4		2
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.	3		
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.	3		3
Industrial Water Treatment: Softening of water-principle- reactions, advantages, limitations and comparison of Zeolite process, and De-mineralization process. Numerical based on Zeolite process.	2		
B] Boiler Troubles–Causes, effect on boiler operation and methods of prevention – Scales and sludges, Caustic embrittlement. Desalination of sea water- Principle, method and advantages of electro dialysis and reverse osmosis processes	2		
Unit-4: Green Chemistry			
A] Green Chemistry: Introduction, twelve principles of Green chemistry with examples, Numerical based on atom economy, Carbon sequestration & Carbon Credits	3		4
B] Green reagents, Dimethyl carbonate and its applications, Supercritical carbon dioxide properties and applications	2		
Biopolymers: Classification based on type, properties and applications of collagen, chitosan, starch.	2		
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.	4		5
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	3		

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

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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	BCV2P06	Applied Chemistry Lab	
Examination Scheme - Practical			
Internal Marks:	University Marks:	Minimum Passing Marks:	Examination Duration:
50 Marks	--	50 Marks	--

List of Experiments: Performance of at least Any six 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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Sem: II	Total Hours Distribution per week		
Total Credit: 3	Lecture (L): 3 Hrs	Tutorial/Activity (T/A): Hrs.	Practical (P): 2 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 II: Friction			
Types of friction, Limiting friction, Laws of Friction, Static Friction; Motion of Bodies, wedge friction, ladder friction Belt friction	5		2
UNITIII: Centroid and Moment of Inertia			
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		3
UNITIV: Analysis of structures- Trusses			
Assumption and Analysis of simple trusses by method of joints & method of sections	5		4
UNITV: Kinetics of Particles			
Kinetics of particles D'Alemberts principle and its application in connected system of particles, Impulse Momentum, Collision of bodies, Work Energy Method.	5		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 S Bhavikatti, Newage International publication

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

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

Exp. No.	List of Experiments
1	To verify law of polygon of forces using Law of Polygon Apparatus
2	To determine the forces in the members of a Jib Crane Apparatus experimentally and graphically
3	Parallel Forces Apparatus
4	Law Of Moment
5	Rolling Friction Apparatus
6	Equilibrium Forces Apparatus
7	To find determine the support reactions of a Simply Supported Beam experimentally and analytically
8	To determine the coefficient of friction between two surfaces of different material on Plane Friction Apparatus.
9	To find the forces in the member of truss using graphical method and hand calculation.
10	To find (1) Principle moment of inertia and (2) Moment of inertia and product of inertia about any inclined axis for a composite figure using Mohr's circle and hand calculation,
11	To determine the coefficient of friction of Coil Friction Apparatus.
12	Kinetics of particles (collision of bodies)
13	To find support reactions of a simply supported beam using graphical method and hand calculation.

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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 thenecessityand behavior of foundations

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

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		3
Form Work- Introduction to Formwork, Scaffolding	2		
UNIT 3			
Foundation-Introduction, Necessity of Foundation, Causes of failure of Foundations and Remedial Measures.	3		4

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		5

ReferenceBooks:

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): 2Hrs.		
Course Code	BSE2P01	Name of Course: 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.