RN SHETTY TRUST ®

RNS INSTITUTE OF TECHNOLOGY

Autonomous Institution affiliated to Visvesvaraya Technological University, Belagavi
Approved By AICTE, New Delhi. Accredited by NAAC 'A+' Grade
RR Nagar, Dr. Vishnuvardhan Road, Bengaluru - 560 098
Ph:(080)28611880,28611881 URL: www.rnsit.ac.in

ESTD.: 2001
An Institute with a Difference



Dr. R N Shetty
Founder



25 RNSIT

DEPARTMENT OF CIVIL ENGINEERING

BACHELOR OF ENGINEERING

Scheme and Syllabus of III & IV Semesters

2025 SCHEME

INSTITUTION'S INNOVATION COUNCIL

www.rnsit.ac.in



VISION

Building RNSIT into a World Class Institution.

MISSION

To impart high quality education in Engineering, Technology and Management with a difference, enabling students to excel in their career by

- Attracting quality students and preparing them with a strong foundation in fundamentals so as to achieve distinctions in various walks of life leading to outstanding contributions.
- Imparting value based, need based, choice based and skill based professional education to the aspiring youth and carving them into disciplined, World class professionals with social responsibility.
- Promoting excellence in Teaching, Research and Consultancy that galvanizes academic consciousness among Faculty and Students.
- Exposing Students to emerging frontiers of knowledge in various domains and make them suitable for Industry, Entrepreneurship, Higher studies, and Research & Development.
- Providing freedom of action and choice for all the Stakeholders with better visibility.

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Scheme and Syllabus
Batch 2025 – 2029
3rd & 4th Semesters

(As per NEP – 2020)

(Effective from the Academic year 2025 – 26)

About RNSIT

RNS Institute of Technology, familiar as RNSIT was established in the year 2001. It is the brainchild of Dr. R. N. Shetty, well known industrialist, and a great philanthropist. The institution was established with a sole purpose of imparting quality education in Engineering, Technology and Management. Being one of the premier engineering colleges in the country RNSIT is marching towards placing itself in the global map by excelling in academics and placements.

Lush green campus, state of the art infrastructure, well equipped laboratories, hundreds of activities, numerous new initiatives, consistent VTU ranks, path breaking placements, cultural extravaganza, Sports events, 4000 + students and 300 + faculty – with all these RNSIT has become dream destination for engineering aspirants across the country.

Founded by a great visionary Dr. R N Shetty, a renowned name in the industries viz construction, manufacturing, hotel, automobile, power & IT services, and education, RNSIT has been scripting history in the field of technical education. Right from its inception in the year 2001, the institution is showing exemplary growth with respect to academics, placements, sports and cultural activities. With 9 UG engineering branches, 4 PG courses and 9 R&D centres. RNSIT is aiming towards becoming the premier engineering institutes in the world.

Vision

Building RNSIT into a World Class Institution

Mission

To impart high quality education in Engineering, Technology and Management with a difference, enabling students to excel in their career by

- Attracting quality Students and preparing them with a strong foundation in fundamentals so as to achieve distinctions in various walks of life leading to outstanding contributions.
- Imparting value based, need based, choice based and skill based professional education to the aspiring youth and carving them into disciplined, World class Professionals with social responsibility.

- Promoting excellence in Teaching, Research and Consultancy that galvanizes academic consciousness among Faculty and Students.
- Exposing Students to emerging frontiers of knowledge in various domains and make them suitable for Industry, Entrepreneurship, Higher studies, and Research & Development.
- Providing freedom of action and choice for all the Stakeholders with better visibility.

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About the Department of Civil Engineering

The Department of Civil Engineering at RNS Institute of Technology (RNSIT), Bengaluru, was established in 2014–15 under Visvesvaraya Technological University (VTU) with an initial intake of 60 students. The department is committed to developing competent Civil Engineers through quality education, practical learning, and industry-oriented training.

The department provides a strong foundation across various Civil Engineering disciplines, supported by experienced faculty members and well-equipped laboratories. Students gain hands-on experience with modern surveying equipment, industry-relevant engineering software, and emerging technologies, enabling them to bridge the gap between theoretical knowledge and practical applications.

To enhance technical competency and professional skills, the department conducts skill development programmes, workshops, internships, industrial interactions, and field-based projects. These activities provide students with practical exposure and prepare them to meet the evolving requirements of the construction and infrastructure industry.

The academic performance of the department is reflected in its student achievements, with two VTU ranks secured by undergraduate students in VTU examinations to date.

The department also places strong emphasis on the continuous professional development of faculty members. Two faculty members have successfully completed the AICTE QIP Post Graduate Certificate Programme in Artificial Intelligence and Machine Learning at IIIT Nagpur. In addition, two faculty members have completed the Lean Manufacturing Practices programme at the Indian Institute of Management Bangalore (IIMB) and received Lean Expert certification. These initiatives strengthen the department's capabilities in Artificial Intelligence, Machine Learning, Lean Practices, and emerging technologies, further supporting innovation and technology-driven education in Civil Engineering.

Vision

Shaping Excellent Civil Engineering Professionals with Societal Focus

Mission

- To emphasize understanding of basic Engineering Concepts

- To develop creative ability to analyze and manage industry challenges
- To establish synergy between teaching and research

Programme Educational Objectives (PEO)

1. **PEO1: Professional Practice:** Graduates will establish themselves as competent civil engineering professionals in industry, government organizations, or as entrepreneurs.
2. **PEO2: Leadership and Ethical Responsibility:** Graduates will demonstrate leadership, teamwork, communication skills, and professional ethics while contributing effectively to societal and environmental development.
3. **PEO3: Higher Studies and Lifelong Learning:** Graduates will pursue higher education, research, or continuous professional development to adapt to emerging technologies and sustainable engineering practices.

Program Outcomes (PO)

1. **PO1: Engineering Knowledge**: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

2. **PO2: Problem Analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

3. **PO3: Design/Development of Solutions**: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

4. **PO4: Conduct Investigations of Complex Problems**: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

5. **PO5: Engineering Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

6. **PO6: The Engineer and The World**: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

7. **PO7: Ethics**: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

8. **PO8: Individual and Collaborative Teamwork**: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

9. **PO9: Communication**: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

10. **PO10: Project Management and Finance**: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

11. **PO11: Life-Long Learning**: Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Programme Specific Outcomes (PSOs)

The Civil Engineering graduates will have

1. **PSO1**: Apply Civil **engineering knowledge** and modern engineering tools to analyze, design, and execute safe and sustainable infrastructure systems.

2. **PSO2**: Solve complex civil engineering problems by **developing innovative, cost-effective**, and environmentally responsible solutions.
3. **PSO3**: Plan and manage civil engineering projects by integrating **research-based knowledge**, project management principles, and professional ethics.

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B.E in Civil Engineering
Scheme of Teaching and Examinations
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the Academic Year 2025-26)

3rd Semester

Sl. No.	Course	Course Code	Course Title	TD/PSB		Teaching & Learning Scheme					Examination				Credits
						CI		LI	TW&SL	# TH/S	Duration In Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P	SL						
1	ASC	25BCVTH301	Probability and Statistics for Civil Engineers	Civil		45	30	0	45	120	3	50	50	100	4
2	IPCC	25BCVIC302	Water and Wastewater Engineering	Civil		45	0	30	45	120	3	50	50	100	4
3	IPCC	25BCVIC303	Building Materials and Construction	Civil		45	0	30	45	120	3	50	50	100	4
4	PCC	25BCVTH304	Solid Mechanics	Civil		45	0	0	45	90	3	50	50	100	3
5	PCC	25BCVTH305	Recent Trends in Civil Engineering	Civil		45	0	0	45	90	3	50	50	100	3
6	PCCL	25BCVLB306	Basic Building Information Modelling Lab	Civil		0	0	30	00	30	3	50	50	100	1
7	AEC	25BCVAE307X	Ability Enhancement Course Laboratory	Civil		0	0	30	00	30	3	50	50	100	1
8	SDC	25BCBPR308	Community Project (Project-Based Learning) / Societal Project	Civil		0	0	0	30	30	3	50	50	100	1
9	NCMC	25BNSSP309	National Service Scheme (NSS)	Campus	NSS coordinator	0	0	0	30	30		100	--	100	PP
		25BPEDU309	Physical Education (PE) (Sports and Athletics)		Physical Education Director										
		25 BYOGA309	Yoga		Yoga Teacher										
		25BMUSK309	Music		Music Teacher										
									Total	**660**		**500**	**400**	**900**	**21**
10	NCMC	25BMADP310	Additional Mathematics - I	Mathematics		14	0	0	14	28	3	100	--	100	PP
11	SKLAB	25BCVSL001	Skill Lab (Bucket List SDL)	Civil		0	0	30	0	30	3	50	50	100	1
									Total	**688**		**600**	**400**	**1000**	**21**

ASC: Applied Science Course, **PCC**: Professional Core Course, **PCCL**: Professional Core Course laboratory, **AEC**: Ability Enhancement Course, **SDC**: Skill Development Course, **NCMC**: Non Credit Mandatory Course, **IPCC**: Integrated Professional Core Course (Refers to Professional Core Course Theory Integrated with practical of the same course), **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation.

L: Lecture, **T**: Tutorial, **P**: Practical, **TW & SL**: Term Work & Self Learning, **# TH/S**: Total Hours per Semester, **CI**: Classroom Instruction, **LI**: Laboratory Instruction, **PEC**: Professional Elective Course, **TD**: Teaching Department, **PSB**: Question Paper Setting Board

Ability Enhancement Course Laboratory			
25BCVAE307A	Data Analytics with Excel	25BCVAE307C	Graphic Statics Lab
25BCVAE307B	Strength of Materials lab	25BCVAE307D	Python Programming Lab for Civil Engineers

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4th Semester

Sl. No.	Course	Course Code	Course Title	TD/PSB		Teaching & Learning Scheme					Examination				Credits
						CI		LI	TW&SL	# TH/S	Duration In Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P	SL						
1	PCC	25BCVTH401	Analysis of Structures	Civil		45	30	0	45	120	3	50	50	100	4
2	IPCC	25BCVIC402	Fluid Mechanics and Hydraulic Machines	Civil		45	0	30	45	120	3	50	50	100	4
3	IPCC	25BCVIC403	Engineering Survey	Civil		45	0	30	45	120	3	50	50	100	4
4	IPCC	25BCVIC404	Engineering Geology	Civil		45	0	30	45	120	3	50	50	100	4
5	PCCL	25BCVLB405	Domestic Plumbing and Electrical Wiring Lab	Civil		0	0	30	00	30	3	50	50	100	1
6	AEC	25BCVAE406X	Ability Enhancement Course Laboratory	Civil		0	0	30	00	30	3	50	50	100	1
7	BSC	25BFETH407	Biology for Engineers	Chemistry/Bio Tech		30	0	0	30	60	2	50	50	100	2
8	SDC	25BESPR408	Environmental Science Project	Civil		0	0	0	30	30	3	50	50	100	1
9	NCMC	25BNSSP409	National Service Scheme (NSS)	Campus	NSS coordinator	0	0	30	30	--		100	--	100	0
		25BPEDU409	Physical Education (PE) (Sports and Athletics)		Physical Education Director										
		25 BYOGA409	Yoga		Yoga Teacher										
		25BMUSK409	Music		Music Teacher										
									Total	**660**		**500**	**400**	**900**	**21**
10	NCMC	25BMADP410	Additional Mathematics - II	Mathematics		14	0	0	14	28	--	100	--	100	PP
11	SKLAB	25BCVSL002	Skill Lab (Bucket List SDL)	Civil		0	0	30	0	30	3	50	50	100	1
									Total	**688**		**600**	**400**	**1000**	**21**

ASC: Applied Science Course, **PCC**: Professional Core Course, **PCCL**: Professional Core Course laboratory, **AEC**: Ability Enhancement Course, **SDC**: Skill Development Course, **NCMC**: Non Credit Mandatory Course, **IPCC**: Integrated Professional Core Course (Refers to Professional Core Course Theory Integrated with practical of the same course), **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation.

L: Lecture, **T**: Tutorial, **P**: Practical, **TW & SL**: Term Work & Self Learning, **# TH/S**: Total Hours per Semester, **CI**: Classroom Instruction, **LI**: Laboratory Instruction, **PEC**: Professional Elective Course, **TD**: Teaching Department, **PSB**: Question Paper Setting Board

Ability Enhancement Course Laboratory			
25BCVAE406A	AI Tools Lab for Civil Engineering	25BCVAE406C	Water Distribution Network Modelling With EPANET Lab
25BCVAE406B	DGPS and QGIS Lab	25BCVAE406D	MATLAB Applications for Civil Engineering

III SEMESTER SUBJECTS

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B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Probability and Statistics for Civil Engineers**		
Course Code	**25BCVTH301**	**Scheme**	**2025**
Type of Course	**Applied Science Course (ASC)**	**Semester**	**III**
Teaching Hours/Week (L: T:P)	**(3:2:0) 75 hrs/Sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L: T:P: TW& SL)	**(45:30:0:45) 120 hrs/Sem**	**SEE Marks**	**50**
Credits	**4**	**Total Marks**	**100**
Examination type	**Theory**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Understand basic statistical & probability concepts, data visualization & representation techniques.
2. Apply probability distributions to model variability in material properties, hydrology, transportation and traffic data.
3. Analyse sampling techniques, random variables, statistical testing applicable to civil engineering.
4. Evaluate relationships using correlation and regression techniques to develop simple predictive models.

Module–1: Elementary Statistics & Probability **9 hrs**

Introduction: Definition, advantages and limitations, Process of Statistical analysis& basics of probability concepts.

Sampling Techniques: Introduction to Sampling, deciding sample sizes, Basic Probability Sampling, Advanced Sampling Design, Estimation and Auxiliary Data, Non-Probability Sampling and Resampling.

Data Collection: Methods of Data Collection, Data Cleaning, Data Structuring

Module–2: Data Representation **9 hrs**

Data Representation Techniques: Non-Graphical Techniques (Tabular and Case form), Graphical Techniques, Purpose of Data Representation, Fundamentals of Data Representation, Qualitative and Quantitative Data, Continuous and Discrete Data, Primary and Secondary Data, Various Classes of Graphical Representation of Data. Arithmetic Mean, Median and Mode of Grouped and Ungrouped Data. Variance and Standard Deviation. Comparison of Various Graphical Representation Techniques.

Module–3: Random variables & Distributions **9 hrs**

Probability Distributions: Discrete Random Variable, Continuous Random Variable, Mathematical Expectations Mean and Variance, Binomial Distribution Problems, Poisson Distribution Problems, Normal Distribution Problems, Weibull distribution

Module–4: Correlation and Regression Analysis **9 hrs**

Correlation: Types of Correlation, Scatter Plots and Correlation, Karl Pearson's Correlation Coefficient. Problems on Correlation Coefficients

Regression Analysis: Types of Regression Analysis, Regression Line, Regression Coefficients,

Properties of Regression Coefficients, Spearman's Rank Correlation Coefficient. Problems on Regression Analysis
Module-5: Testing of Hypothesis & Curve fitting **9 hrs**
Formulation of Null Hypothesis, alternate Hypothesis, Critical and acceptance Region, Level of Significance, Distribution of Mean when sampling a Normal and Non-Normal Population, Significance Testing, Student's 't' Test, Chi-squared Test, Problems on Hypothesis testing and Significance testing. Significance of sample sizes

APPLICATION TO BE DISCUSSED IN RELEVANT CHAPTER:

Activity-Based Learning (30 hrs)			
Sl. No.	**Civil Engineering Area**	**Statistical Tool Used**	**Purpose**
1	Concrete Technology	Mean, SD, Control Charts	Quality Control
2	Transportation	Regression, Probability	Traffic Prediction
3	Hydrology	Frequency Analysis	Flood & Drainage Design
4	Structural Engineering	Reliability Theory	Safety Assessment
5	Pavement Engineering	Variance Analysis	Thickness Control
6	Project Management	PERT, Probability	Time Estimation
7	Geotechnical Engineering	Mean, SD, Distribution	Soil Characterization
8	Environmental Engineering	Trend Analysis	Pollution Monitoring

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the concepts of probability, sampling and data collection
CO2	Apply various probability distributions to calculate their statistical moments.
CO3	Analyze samples for testing of hypothesis and significance on large and small samples
CO4	Evaluate the characteristics through correlation and regression techniques for various civil engineering applications.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. Gupta, S. C., & Kapoor, V. K. (2020). Fundamentals of Mathematical Statistics (12th ed.). Sultan Chand & Sons.
2. Walpole, R. E., Myers, R. H., Myers, S. L., & Ye, K. (2012). Probability & Statistics for Engineers & Scientists (9th ed.). Pearson

Reference books

1. Benjamin, J. R., & Cornell, C. A. (2014). Probability, Statistics, and Decision for Civil Engineers. Dover Publications, Inc. (Original work published 1970).
2. Montgomery, D. C., &Runger, G. C. (2018). Applied Statistics and Probability for Engineers (7th ed.). Wiley. 3

Web links and e-Resources:

1. Probability and Statistics for Civil Engineering (Lecture Notes), JNTU Anantapur: http://vemu.org/uploads/lecture_notes/17_02_2023_914719312.pdf.
2. Ross, S. M. Introduction to Probability and Statistics for Engineers and Scientists (Supplementary Material), Elsevier.
3. NPTEL (National Programme on Technology Enhanced Learning) - Probability and Statistics courses for Engineers: https://nptel.ac.in/.

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B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Water and Wastewater Engineering**		
Course Code	**25BCVIC302**	**Scheme**	**2025**
Type of Course	**Integrated Professional Core Courses (IPCC)**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(3:0:2) 75 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(45:0:30:45) 120 hrs/sem**	**SEE Marks**	**50**
Credits	**4**	**Total Marks**	**100**
Examination type	**Theory- CIE +SEE & Lab-CIE only**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Understand the fundamental principles of water demand, population forecasting, water quality parameters, and water treatment methodologies in accordance with BIS standards.
2. Apply biological wastewater treatment principles for the selection of treatment systems and effluent disposal methods.
3. Determine the quality characteristics of water and wastewater using physical, chemical, and biological parameters.
4. Design engineering components of water treatment, water distribution, and wastewater treatment system

Module–1: Fundamentals of Water Supply **9 hrs**

Demands For Water: Need for protected water supply, units of measurements, types of water demand, numerical problem on fire demand.

Population Forecasting: Different methods with merits & demerits, numerical problems on arithmetic increase method, geometric increase method, incremental increase method and decrease growth rate method.

Collection of Water: Intake structures – Different types of intakes; Criteria for selection and location of intakes.

Water Treatment Methodologies: Treatment flow-chart aeration - principles, application and types of aerators. Bureau of Indian Standards (BIS) standard IS 10500:2012

Module–2: Primary and Secondary Water Treatment **9 hrs**

Sedimentation: Theory of sedimentation, Stokes law, settling velocity, c/s of settling tank, types, numerical problems on design of rectangular settling tank.

Coagulation: Requirements of a good coagulant, types of coagulants, jar test experiment.

Filtration: Mechanism – Theory of filtration, types. Slow Sand Filter (SSF) & Rapid Sand Filter (RSF): C/S diagram, filter media, working principle & numerical problems on design of SSF & RSF.

Pressure Filter (PF): C/S diagram, filter media, working principle of PF.

Comparative Study: Advantages, disadvantages and suitability of SSF, RSF & PF

Module–3: Tertiary Water Treatment & Distribution **9 hrs**

Disinfection: Theory of disinfection, requirements of a good disinfectant, types of disinfection methods. Chlorination- Stages of chlorination, breakpoint chlorination,

residual chlorine.
Softening: Definition, causes of hardness, methods of hardness removal by Lime soda process and Zeolite process; Reverse Osmosis & Membrane reactor.
De-Fluoridation: Need of de-fluoridation, methods of de-fluoridation.
Distribution System: Methods of setting water distribution system layouts.
Waste Water Treatment: Flow diagram of municipal wastewater treatment plant; Importance of each treatment unit.

Module–4: Biological Treatment of Wastewater **9 hrs**

Dissolved Oxygen (DO) & Biochemical Oxygen Demand (BOD): Importance of DO and BOD, First stage and second stage BOD (No Derivation); Basic numerical problems on BOD. Aerobic And Anaerobic Digestion: Concept and principle.
Attached Growth System: Trickling Filter-C/S diagram & components, working principle & process description; Rotating biological contactor.
Suspended Growth System: Activated Sludge Process (ASP)- Flow diagram, working principle & process description, importance of recirculation, list of modifications in ASP; F/M Ratio & MLSS

Module–5: Low-Cost Wastewater Treatment and Disposal **9 hrs**

Low-Cost Wastewater Treatment Methods: Septic Tank- Importance, plan and section, numerical problems on design of septic tank. Soak pit, oxidation pond and oxidation ditch, anaerobic & facultative stabilization ponds.
Disposal of Effluents: Disposal of effluents by dilution, self-purification phenomenon. Oxygen sag curve, zones of purification, effluent disposal standards. Streeter Phelps equation.
Latest Innovative Developments in Wastewater Treatment.

Experiments:

1. Assessment of solid content in water and wastewater, including various physical and chemical classifications.
2. Estimation of chloride concentration in water samples to evaluate salinity levels.
3. Analysis of buffering capacity in water through alkalinity measurement.
4. Examination of water corrosiveness and pollution indicators via acidity testing.
5. Measurement of hydrogen ion concentration to assess water's acid-base balance.
6. Quantification of hardness-causing minerals, focusing on calcium, magnesium, and total hardness levels.
7. Evaluation of oxygen availability and biological stability through Dissolved Oxygen and Biochemical Oxygen Demand analysis.
8. Determination of Chemical Oxygen Demand to assess organic load in wastewater.
9. Quantitative analysis of active chlorine content in bleaching powder for disinfection efficiency.
10. Monitoring of post-treatment chlorine levels and calculation of chlorine demand in water samples.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the concepts of water demand, population forecasting, water quality parameters, and water treatment methodologies in accordance with BIS standards.
CO2	Apply biological wastewater treatment principles for wastewater treatment and effluent disposal.
CO3	Determine the physical, chemical, and biological characteristics of water and wastewater.
CO4	Design water treatment units, distribution systems, and wastewater treatment units based on engineering principles.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	**20**	**8**	**Marks of Experiments, Record and Test awarded for a maximum of 20 marks.**
CIE: Theory + Practical (A + B + C)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**

SEE (D)	**50**	**18**	**SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall before 3 hours.**
CIE+SEE **(A+B+C+D)**	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B, C and D**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only.

Suggested Learning Resources:

Textbooks

1. S. K. Garg, "Environmental Engineering-Water Supply Engineering", 37th ed., vol. I, Khanna Publishers, 2024.
2. S. K. Garg, "Environmental Engineering- Sewage Waste Disposal and Air Pollution Engineering", 46th ed., vol. II, Khanna Publishers, 2024.
3. Dr. B. C. Punmia, Er. Ashok Kr. Jain, Dr. Arun Kumar Jain, "Environmental Engineering-Water Supply Engineering", 2nd ed., vol. I, Laxmi Publications, 2022.
4. Dr. B. C. Punmia, Er. Ashok Kr. Jain, Dr. Arun Kumar Jain "Environmental Engineering-Water Supply Engineering", 2nd ed., vol. II, Laxmi Publications, 2022.

Reference books

1. Howard S. Peavy, Donald R. Rowe, George T, "Environmental Engineering", McGraw Hill, 2017.
2. Metcalf & Eddy, "Waste Water Engineering: Treatment & Reuse", 4th ed., McGraw Hill Education, 2023.
3. Hammer. M.J, "Water and Waste Water Technology", 7th ed., Pearson, 2011.
4. CPHEEO, "Manual on Water Supply and Treatment", 3rd ed., Ministry of Urban Development, 1999.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Building Materials and Construction**		
Course Code	**25BCVIC303**	**Scheme**	**2025**
Type of Course	**Integrated Professional Core Courses (IPCC)**	**Semester**	**III**
Teaching Hours/Week (L: T: P)	**(3:0:2) 75hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L: T:P:TW&SL)	**(45:0:30:45) 120hrs/sem**	**SEE Marks**	**50**
Credits	**4**	**Total Marks**	**100**
Examination type	**Theory- CIE +SEE & Lab-CIE only**	**Exam hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the properties, applications, and testing methods of building and sustainable construction materials.
2. Apply the principles of foundations, masonry systems, and building components in construction practice.
3. Analyze conventional and modern construction systems, temporary works, and emerging construction technologies.
4. Evaluate the quality and suitability of construction materials, masonry systems, and building finishes using standard testing procedures and construction practices.

Module – 1: Building Materials and Sustainable Construction Materials	**9 hrs**
Stones, bricks, cement, concrete blocks, AAC blocks, timber, fine and coarse aggregates; classification, properties, applications and testing of building materials; sustainable construction materials including M-Sand, recycled aggregates and green concrete.	
Module – 2: Foundations and Masonry Systems	**9 hrs**
Soil investigation and safe bearing capacity of soils; selection and types of shallow and deep foundations; brick masonry and stone masonry; masonry bonds and joints; load-bearing, partition and cavity walls; modern masonry systems using AAC blocks, fly ash bricks and energy-efficient walling systems.	
Module – 3: Building Components and Roofing Systems	**9 hrs**
Lintels, arches, balconies, chajjas and canopies; doors, windows and ventilators—materials, components and types; staircases—components, requirements and types; flooring materials and methods of floor construction; pitched roofs, RCC roofs, roof trusses and roofing materials.	
Module – 4: Construction Systems and Temporary Works	**9 hrs**
Formwork systems, scaffolding, shoring and underpinning; aluminium formwork, tunnel formwork, slip formwork and table formwork; prefabricated and precast construction systems; modular construction; introduction to 3D-printed construction technology.	
Module – 5: Building Finishes and Sustainable Buildings	**9 hrs**

Mortars, plastering, pointing, damp proofing, waterproofing and paints; defects and applications of finishing materials; introduction to green buildings, net-zero buildings, smart buildings and IoT applications in construction.

PRACTICAL COMPONENT OF IPCC

Sl. No.	Set of Experiments (30 hrs)
1	**Determination of Water Absorption of Bricks** – **IS 3495 (Part 2): 1992** – Methods of Tests of Burnt Clay Building Bricks.
2	**Sieve Analysis of Fine Aggregate** – **IS 2386 (Part 1): 1963** – Methods of Test for Aggregates for Concrete.
3	**Sieve Analysis of Coarse Aggregate** – **IS 2386 (Part 1): 1963** – Methods of Test for Aggregates for Concrete.
4	**Determination of Bulking of Fine Aggregate** – **IS 2386 (Part 3): 1963** – Methods of Test for Aggregates for Concrete.
5	**Determination of Bulk Density of Fine and Coarse Aggregates** – **IS 2386 (Part 3): 1963** – Methods of Test for Aggregates for Concrete.
6	**Determination of Flakiness Index of Coarse Aggregate** – **IS 2386 (Part 1): 1963** – Methods of Test for Aggregates for Concrete.
7	**Determination of Elongation Index of Coarse Aggregate** – **IS 2386 (Part 1): 1963** – Methods of Test for Aggregates for Concrete.
8	**Construction of Brick Masonry** – **IS 2212: 1991** – Code of Practice for Brickwork.
9	**Construction of Stone Masonry** – **IS 1597 (Part 1): 1992** – Construction of Rubble Stone Masonry.
10	**Construction of Autoclaved Aerated Concrete (AAC) Block Masonry Wall** – **IS 6041: 1985** – Code of Practice for Construction of Autoclaved Cellular Concrete Block

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the properties, applications, and testing methods of building and sustainable construction materials.
CO2	Apply the principles of foundations, masonry systems, and building components in construction.
CO3	Analyze construction systems, temporary works, and modern construction technologies.
CO4	Evaluate the suitability of building materials and masonry systems using standard tests and construction practices.

ASSESSMENT DETAILS (Both CIE and SEE)

4-Credit Lab Integrated Theory Courses (IPCC)			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment method as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	**20**	**8**	**Marks of Experiments, Record and Test awarded for a maximum of 20 marks.**
CIE: Theory + Practical (A + B + C)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (D)	**50**	**18**	**SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE+SEE (A+B+C+D)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B, C and D**
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only.			

Suggested Learning Resources:

Text Books

1. B.C. Punmia, A.K. Jain and A.K. Jain, *Building Construction*, 11th ed., Laxmi Publications Pvt. Ltd., New Delhi, 2016.
2. S.C. Rangwala, *Engineering Materials*, Charotar Publishing House Pvt. Ltd., Anand, 2019.
3. S. Kumar, *Building Construction*, Standard Publishers & Distributors, New Delhi, 2019.

Reference Books

1. S.K. Duggal, *Building Materials*, 6th ed., New Age International Publishers, New Delhi, 2024.
2. M.S. Shetty and M. Mokal, *Concrete Technology: Theory and Practice*, 9th ed., S. Chand & Company Ltd., New Delhi, 2026.
3. K.N. Jha, *Formwork and Scaffolding Engineering*, Pearson Education India, 2012.

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ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Solid Mechanics**		
Course Code	**25BCVTH304**	**Scheme**	**2025**
Type of Course	**Professional Core Course (PCC)**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(3:0:0) 45 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(45:0:0:45) 90 hrs/sem**	**SEE Marks**	**50**
Credits	**3**	**Total Marks**	**100**
Examination type	**Theory**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the behaviour of materials subjected to simple stresses, strains, thermal effects, and elastic deformations.
2. Apply the principles of shear force, bending moment, bending stress, and shear stress in beam analysis.
3. Analyse compound stress conditions and the stability of columns and struts under different loading conditions.
4. Evaluate the response of structural systems and determinate trusses based on equilibrium requirements.

Module–1: Simple Stresses and Strains **9 hrs**

Simple Stresses and Strains: Stress Strain behaviour of mild steel and concrete, Analysis of bars of uniform and varying(stepped) cross sections, Analysis of Simple and Composite bars of equal and unequal lengths, Expression of Elastic constants and interrelationship. Thermal stress in simple and composite bars, Volumetric strain.

Module–2: Shear Force and Bending Moment in Beams **9 hrs**

Shear Force and Bending Moment In Beams: Shear forces and bending moments, Sign conventions, Relationship between shear force and bending moments Shear force and bending moment diagrams on Simply Supported Beams, Overhanging beams, Cantilever beams subjected to concentrated loads, uniform distributed load, uniform varying load, couple and their combinations.

Module– 3: Bending and Shear Stresses in Beams **9 hrs**

Bending Stress in Beams: Introduction, Assumptions in simple bending theory, Expression for Bending equation, Modulus of rupture, Section modulus, Flexural rigidity, Bending stress distribution in beams of rectangular, I section and T-sections.

Shear Stresses in Beams: Expression for horizontal shear stress in beam, Shear stress diagram for simple rectangular, I section and T-sections.

Module–4: Compound Stresses and Stability of Columns **9 hrs**

Compound Stresses: Introduction, state of stress at a point, General two-dimensional stress system, Principal stresses and principal planes.

Analysis of Columns and Struts: Introduction, Euler's theory on columns, Effective length, Slenderness ratio, Short and long columns, Radius of gyration, Buckling load, Expression for Euler's Buckling load for different end conditions, Limitations of Euler's theory, Rankine's formula. Eccentric loading.

Module–5: Introduction to Structural Forms and Truss Analysis **9 hrs**

Introduction to Structural Forms: Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and nonlinear analysis, Static and kinematic indeterminacies of structural systems. **Analysis of Plane Trusses:** Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints and method of sections.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the behaviour of materials and structural members subjected to loads.
CO2	Apply the method of joints and sections for determinate trusses.
CO3	Analyze various stresses in determinate beams and columns subjected to various loading conditions.
CO4	Evaluate shear force, bending moment and stress distributions in determinate beams under various loading conditions.

ASSESSMENT DETAILS (Both CIE and SEE)

2, 3 and 4-Credit Theory Courses			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.
Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE	**100**	**40**	Final marks shall be the sum of marks

(A+B+C)			scored in Components **A, B and C.**

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.
- **If any courses of 3 credits are of Integrated Course type, for such courses the method suggested for 4 credits IPCC shall be followed.**

Suggested Learning Resources:

Textbooks

1. R. K. Bansal, "A Textbook of Strength of Materials: Mechanics of Solids," 7th ed., Laxmi Publications, 2024.
2. S. Ramamrutham, "Theory of Structures," 9th ed., Dhanpat Rai Publishing Company Private Limited, New Delhi, 2010.
3. R. S. Khurmi and N. Khurmi, "A Textbook of Strength of Materials: Mechanics of Solids (SI Units)," 26th ed., S. Chand Publishers, New Delhi, 2018.

Reference books

1. C. S. Reddy, "Basic Structural Analysis," 3rd ed., Tata McGraw Hill Publication Company Ltd., New Delhi, 2017.
2. R. C. Hibbeler, "Mechanics of Materials," 11th ed., Pearson Education, London, 2023.
3. S. P. Timoshenko and D. H. Young, "Elements of Strength of Materials," 5th ed., Affiliated East-West Press, 2003.

ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Recent Trends in Civil Engineering**		
Course Code	**25BCVTH305**	**Scheme**	**2025**
Type of Course	**Professional Core Course (PCC)**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(3:0:0) 45 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(45:0:0:45) 90 hrs/sem**	**SEE Marks**	**50**
Credits	**3**	**Total Marks**	**100**
Examination type	**Theory**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Develop a fundamental understanding of AR/VR, AI, ML, IoT, and Robotics and their applications in Civil Engineering.
2. Apply emerging digital and intelligent technologies to construction, surveying, structural monitoring, infrastructure, and project planning.
3. Analyze data generated through AI/ML and IoT-based systems for monitoring, prediction, interpretation, and decision-making.
4. Evaluate the role and effectiveness of emerging technologies in improving safety, quality, productivity, precision, and automation in Civil Engineering.

Module–1: Augmented Reality(AR) and Virtual Reality(VR) 9 hrs

Introduction to Augmented Reality (AR) and Virtual Reality (VR) – Definitions, Advantages, and Limitations; Difference between AR and VR; Components of AR and VR systems; Basic hardware and software tools; Working principles of AR and VR devices; Building Information Visualization using AR and VR; Applications in building planning, Structural visualization, Construction site monitoring, Surveying, Urban planning, and Smart city projects; Virtual walkthroughs of residential and commercial buildings; Benefits of AR and VR in project planning, presentation, communication, and decision-making.

Module–2: Artificial Intelligence (AI) in Civil Engineering 9 hrs

Introduction to AI–Definition, Evolution, Current Status, Advantages and Limitations; Applications of AI in Civil Engineering– Building Planning and Design, Surveying and Mapping, Construction Management and Safety, Transportation Engineering, Environmental Engineering, Quantity Estimation and Cost Analysis, Structural Design and Smart City Applications; Techniques of AI (Basic Concepts) – Artificial Neural Networks (ANN), Genetic Algorithms (GA), and Fuzzy Logic; Simple numerical problems on ANN, Genetic Algorithms, and Fuzzy Logic.

Module– 3: Machine Learning (ML) in Civil Engineering 9 hrs

Definition and scope of ML, Differences between AI and ML, Importance of ML in Civil Engineering, Types of ML – Supervised and Unsupervised learning (basic concepts only); Common ML Algorithms – Linear Regression and K-Means Clustering; Simple numerical examples.

Module–4: Internet of Things (IoT) in Civil Engineering	**9 hrs**
Introduction to IoT in Smart Infrastructure, Applications of simulation software (basic concepts only), Sensor-based structural monitoring using IoT, Integration of IoT with Concrete Curing and Non-Destructive Testing (NDT) Techniques, Data-driven and Analytical prediction techniques in Civil Engineering, Numerical examples on IoT-enabled data monitoring and interpretation in intelligent infrastructure systems.	
Module–5: Robotics in Civil Engineering	**9 hrs**
Introduction to Robotics: Definition and fundamentals of robotics, Asimov's Laws of Robotics, components of a robot, classification of robots, robot anatomy and basic robotic systems. **Robotics in Construction**: Applications of robotics in the construction industry; Types of construction robots including demolition robots, bricklaying robots, exoskeleton robots, welding and fabrication robots, and 3D concrete printing robots. **Role and Benefits of Robotics**: Construction automation, improved safety, quality, productivity, and precision, and use of robots for hazardous and repetitive tasks. Limitations and challenges of robotics in Civil Engineering	

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the fundamental concepts, components, working principles, and applications of AR/VR, AI, ML, IoT, and Robotics in Civil Engineering.
CO2	Apply emerging technologies and basic AI/ML techniques for construction planning, surveying, structural monitoring, concrete curing, and infrastructure applications.
CO3	Analyze sensor-generated data and technology-enabled systems for monitoring, prediction, interpretation, and informed decision-making in Civil Engineering.
CO4	Evaluate the suitability of AR/VR, AI, ML, IoT, and Robotics for improving safety, quality, productivity, precision, and automation in Civil Engineering applications.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given*), scaled to 20 marks.

Total CIE (A + B)	50	20	CIE Evaluation is done for a maximum of 50 marks.
SEE (C)	50	18	SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
• The minimum marks to be secured in CIE is **20 (40%) out of allotted 50 marks** to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. Vagelis Plevris, Afaq Ahmad and Nikos D. Lagaros, "Artificial Intelligence and Machine Learning Techniques for Civil Engineering," IGI Global, 2023.
2. D. Schmalstieg, and T. Hollerer, "Augmented Reality: Principles and Practice," 1st ed., Addison-Wesley Professional, 2016.

Reference books

1. A. Bahga and V. Madisetti, "Internet of Things: A Hands-On Approach", 1st ed., Universities Press (India) Private Limited, 2015.
2. T. Bock and T. Linner, "Robot-Oriented Design: Design and Management Tools for the Deployment of Automation and Robotics in Construction," 1st ed., Cambridge University Press, 2015.

ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Basic Building Information Modelling Lab**		
Course Code	**25BCVLB306**	**Scheme**	**2025**
Type of Course	**Professional Core Course Laboratory (PCCL)**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(0:0:2) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:30:0) 30 hrs/sem**	**SEE Marks**	**50**
Credits	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the principles of building planning, drafting standards, and Building Information Modelling (BIM) concepts used in building design.
2. Apply AutoCAD tools and drafting conventions for the preparation of building drawings and construction documentation.
3. Develop architectural models of residential buildings using BIM tools and Revit software.
4. Generate building models and documentation through views, schedules, and coordinated design workflows.

Sl. No.	Experiments
1	**Building Drawing using AutoCAD:** Universal signs and symbols, line types, scales, layers, dimensioning and building elements.
2	**Building Planning**: Principles of Building Planning, Classification of buildings and Building by-laws as per National building Code (NBC).
3	**Development of Plan, Elevation, Section and Schedule of Openings** for Single Storey and Two Storey Residential Buildings.
	Introduction Building Information Modelling
4	**Introduction to Building Information Modelling (BIM):** BIM concepts, BIM workflow, CAD vs BIM, Revit Project Templates and User Interface.
5	**Levels and Grids (Datum Planes):** Setting up Levels & Modifying, Creating Grids in Revit.
6	**Modelling Walls, Doors and Windows:** Creating and Modifying Architectural Elements and Families.
7	**Modelling Floors, Roofs, Stairs, Railings and Ramps** in Revit.
8	**Working with Views and Documentation:** Plans, Elevations, Sections, Callouts, Visibility Graphics and 3D Views.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the principles of building planning, building by-laws, drafting standards, and BIM concepts.
CO2	Prepare plans, elevations, sections, and schedules of openings for residential buildings using AutoCAD.
CO3	Develop BIM-based architectural models incorporating building elements using Revit.
CO4	Generate building documentation and visualizations including plans, elevations, sections, schedules, and 3D views from BIM models.

ASSESSMENT DETAILS (Both CIE and SEE)

1-Credit Lab Course			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. R. Sacks, C. Eastman, G. Lee, P. Teicholz and K. Liston, "BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers," 4th ed., John Wiley & Sons, 2024.
2. S. S. Bhavikatti and M. V. Chitawadagi, "Building Planning and Drawing," 1st ed., I K International Publishing House Pvt. Ltd., 2014.
3. R. S. Malik and G. S. Meo, "Civil Engineering Drawing," 5th ed., Computech Publication Pvt. Ltd., 2023.

Reference books

1. M. G. Shah, C. M. Kale and S. Y. Patki, "Building Drawing with an Integrated Approach to Built Environment," 6th ed., Tata McGraw Hill, 2019.
2. J. Ingram, "Understanding BIM: The Past, Present and Future of Building Information Modelling," Routledge, 2023.
3. "National Building Code of India 2016 (NBC 2016)," Bureau of Indian Standards (BIS), 2016.

ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Data Analytics with Excel**		
Course Code	**25BCVAE307A**	**Scheme**	**2025**
Type of Course	**Ability Enhancement Course (AEC) Laboratory**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(0:0:2) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:30:0) 30 hrs/sem**	**SEE Marks**	**50**
Credits	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Understand the use of Spreadsheet for data collection.
2. Solve the equations using Excel functions
3. Analyze the data to get the proper visualization

Sl. No.	Experiments
1	Introduction to Data Analysis Using Spreadsheets: Fundamentals of spreadsheet applications, Excel interface, and learn how to navigate around a worksheet and workbook.
2	Using Excel Spreadsheets: Perform basic spreadsheet tasks, such as viewing, entering, editing data, moving, copying and filling data. The fundamentals of formulas and most common functions.
3	Cleaning & Wrangling Data Using Spreadsheets: Importance of data quality, how to import file data into Excel, fundamentals of data privacy, remove duplicate and inaccurate data, and how to remove empty rows.
4	Inconsistencies in data, Flash fill and Text to Columns features to help you manipulate and standardize data.
5	Analysing Data using Spreadsheets: Fundamentals of analysing data using a spreadsheet, filter and sort data.
6	Use of VLOOKUP and HLOOKUP reference functions. Introduction to Power Query.
7	Create pivot tables in Excel and use several pivot table features.
8	Use of charts- Bar chart, Pie, Scatter plot correlation equations.
9	Final Project – To enable students to apply the concepts of data preparation and analysis using spreadsheet tools in a practical, hands-on environment. Basic Statistical Analysis (Mean, Median, Standard Deviation).
10	Submission of report for final assessment.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the spreadsheet to categorize the data sets.
CO2	Apply excel function for calculation purposes.
CO3	Interpret the data to obtain practical solutions.

ASSESSMENT DETAILS (Both CIE and SEE)

1-Credit Lab Course			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. Manisha Nigam. (2019). *Data Analysis with Excel*, bpb Publications.
2. Joe Penn. (2020). *Data Analysis with Excel*, Kindle Edition.

Reference books

1. George Mount. (2024), *Modern Data Analytics in Excel*, O'Reilly Media, Inc. Publishers.
2. Manisha Nigam (2020). *Advanced Analytics with Excel*, bpb Publishers.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Strength of Materials Lab**		
Course Code	**25BCVAE307B**	**Scheme**	**2025**
Type of Course	**Ability Enhancement Course (AEC) Laboratory**	**Semester**	**III**
Teaching Hours/Week (L: T: P)	**(0:0:2) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L: T:P:TW&SL)	**(0:0:30:0) 30hrs/sem**	**SEE Marks**	**50**
Credits	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the properties and behaviour of engineering materials used in civil engineering applications.
2. Apply standard testing procedures to determine the mechanical properties of engineering materials.
3. Analyze the performance of materials based on test results obtained from laboratory investigations.
4. Evaluate the suitability of engineering materials for structural and construction applications based on their mechanical properties.

Sl. No.	Set of Experiments (30 hrs)
1	**Determination of Compressive Strength of Bricks and Blocks** – *IS 3495 (Part 1 & 2): 1992* (Bricks), *IS 2185 (Part 1): 2005* (Concrete Masonry Blocks)
2	**Determination of Tensile Strength of Mild Steel and HYSD Specimens** – *IS 1608: 2005* (Mechanical Testing of Metals – Tensile Testing)
3	**Determination of Shear Strength of Mild Steel Specimen** – *IS 5242: 1979* (Methods of Shear Testing of Metals)
4	**Determination of Torsional Strength of Mild Steel Rod** – *IS 1717: 1987* (Methods for Torsion Testing of Metallic Materials)
5	**Determination of Flexural Strength of Wooden Beam** – *IS 1708 (Part 5): 1986* (Mechanical Properties of Wood – Flexural Strength)
6	**Determination of Impact Strength of Metallic Specimens using Izod Test** – *IS 1598: 1977* (Method for Impact Test on Metals – Izod Test)
7	**Determination of Impact Strength of Metallic Specimens using Charpy Test** – *IS 1757: 1988* (Method for Impact Test on Metals – Charpy Test)
8	**Determination of Rockwell Hardness Number of Metallic Specimens** – *IS 1586 (Part 1): 2018* (Rockwell Hardness Test)
9	**Determination of Brinell Hardness Number of Metallic Specimens** – *IS 1500: 2005* (Brinell Hardness Test for Metallic Materials)
10	**Determination of Vickers Hardness Number of Metallic Specimens** – *IS 1501 (Part 1): 2013* (Vickers Hardness Test)

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the physical and mechanical properties of engineering materials used in construction.
CO2	Perform standard tests on engineering materials in accordance with relevant Indian Standards
CO3	Analyze the mechanical behaviour of engineering materials using test results.
CO4	Evaluate the suitability of engineering materials for engineering applications based on test results and relevant Indian Standards

ASSESSMENT DETAILS (Both CIE and SEE)

1-Credit Lab Course			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE Practical (A)	30	–	Marks awarded for weekly conduct of experiments and submission of laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	–	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 20 marks.
Total CIE Practical	50	20	Sum of marks of experiments, record, and test shall be the CIE marks awarded for a maximum
SEE (C)	50	20	SEE is a laboratory examination conducted for 100 marks and scaled down to 50 marks. The examination duration shall be 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. B.C. Punmia, A.K. Jain and A.K. Jain, *Strength of Materials*, Laxmi Publications, 2017.
2. R.K. Bansal, *A Textbook of Strength of Materials (SI Units)*, 5th ed., Laxmi Publications, 2010.
3. S.S. Rattan, *Strength of Materials*, 3rd ed., McGraw Hill Education (India) Pvt. Ltd., 2017.

Reference Books

1. F.P. Beer, E.R. Johnston, J.T. DeWolf and D.F. Mazurek, *Mechanics of Materials (SI Units)*, 8th ed., McGraw Hill Education, 2021.
2. R.C. Hibbeler, *Mechanics of Materials*, 11th ed., Pearson Education, 2023.
3. V.D. Kodgire and S.V. Kodgire, *Material Science and Metallurgy for Engineers*, Everest Publishing House, 2018.

RNS
ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Graphic Statics Lab**		
Course Code	**25BCVAE307C**	**Scheme**	**2025**
Type of Course	**Ability Enhancement Course (AEC) Laboratory**	**Semester**	**III**
Teaching Hours/Week (L: T: P)	**(0:0:2) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L: T:P:TW&SL)	**(0:0:30:0) 30 hrs/sem**	**SEE Marks**	**50**
Credits	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the principles of force systems, equilibrium, centroid, and moment of inertia.
2. Apply graphical methods to determine resultants and support reactions.
3. Analyze centroids, moments of inertia, and trusses using graphical techniques.
4. Evaluate graphical solutions in engineering mechanics applications.

Sl. No.	Set of Experiments (30 hrs)
1	Resultant of Coplanar Concurrent Forces using graphical method
2	Equilibrium of Coplanar Concurrent Forces using graphical method.
3	Resultant of Parallel Force System using graphical method.
4	Resultant of Non-Concurrent Force System using graphical method.
5	Determination of Support Reactions of Simply Supported Beam using graphical method.
6	Determination of Support Reactions of Overhanging Beam using graphical method.
7	Determination of Support Reactions of Beam Subjected to Multiple Point Loads using graphical method.
8	Determination of Centroid of Simple Plane Figures using graphical method.
9	Determination of Centroid of Composite Sections using graphical method.
10	Determination and Comparison of Moment of Inertia of Composite Sections using graphical method.
11	Demonstration of Analysis of truss by graphical method.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the principles of force systems, equilibrium, centroid, and moment of inertia.
CO2	Determine resultants and support reactions of force systems and beams using graphical methods.
CO3	Analyze centroids, moments of inertia, and trusses using graphical techniques.
CO4	Evaluate graphical solutions for engineering mechanics problems.

ASSESSMENT DETAILS (Both CIE and SEE)

1-Credit Lab Course			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE Practical (A)	30	–	Marks awarded for weekly conduct of experiments and submission of laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	–	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 20 marks.
Total CIE Practical (A+B)	50	20	Sum of marks of experiments, record, and test shall be the CIE marks awarded for a maximum of 50.
SEE (C)	50	20	SEE is a laboratory examination conducted for 100 marks and scaled down to 50 marks. The examination duration shall be 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources

Textbooks

1. R.S. Khurmi, *Engineering Mechanics*, S. Chand Publishing, 2018.
2. S. Rajasekaran and G. Sankarasubramanian, *Engineering Mechanics: Statics and Dynamics*, Vikas Publishing House Pvt. Ltd., 2017.
3. D.S. Kumar, *Engineering Mechanics*, S.K. Kataria & Sons, New Delhi, 2018.

Reference Books

1. R.C. Hibbeler, *Engineering Mechanics: Statics*, 15th ed., Pearson Education, 2022.
2. J.L. Meriam, L.G. Kraige and J.N. Bolton, *Engineering Mechanics: Statics and Dynamics*, 9th ed., Wiley India Pvt. Ltd., 2023.
3. F.P. Beer, E.R. Johnston Jr., D.F. Mazurek and P.J. Cornwell, *Vector Mechanics for Engineers: Statics and Dynamics*, 12th ed., McGraw Hill Education, 2024.

B.E. (Civil Engineering)
Outcome-Based Education (OBE) and Choice-Based Credit System (CBCS)

Course Title:	**Python Programming Lab for Civil Engineers**		
Course Code:	**25BCVAE307D**	**Scheme**	**2025**
Type of Course	**Ability Enhancement Course (AEC) Laboratory**	**Semester**	**III**
Teaching Hours/Weeks (L:T : P)	**(0:0:2) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:30:0) 30 hrs/sem**	**SEE Marks**	**50**
Credits:	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the fundamentals of Python programming for problem-solving skills using programming techniques.
2. Apply Python programming concepts for mathematical computations and engineering calculations relevant to Civil Engineering.
3. Analyze engineering data using Python libraries.
4. Interpret results pertaining to data processing, numerical methods, and graphical representation.

Sl. No.	Experiments
1	Introduction to Python environment, variables, input–output, basic arithmetic and conditional statements.
2	Python basics for civil computations. Read two or more engineering values and compute arithmetic operations, unit conversion, and basic conditional checks.
3	Write a program to compute stress, discharge, and density using functions.
4	Tabular civil data handling. Store civil data such as rainfall & traffic counts using lists and tuples; perform insertion, deletion, and summary operations
5	Dictionary-based data mapping. Use dictionaries to map material grades, soil classifications and retrieve values by key.
6	Statistics for civil datasets. Read a list of values and compute mean, variance, standard deviation, minimum, maximum, and outlier checks.
7	Script for basic fluid mechanics calculations – Reynolds number, Bernoulli equation between two points, head loss using Darcy– Weisbach equation
8	Read and analyze engineering datasets using Pandas Data Frames and visualize results using Matplotlib for load–deflection, stress–strain, rainfall, & traffic data.
9	Use of functions and modules to organize repetitive calculations (e.g., design-style checks for sections).(Demonstrate)

COURSE OUTCOMES:

After completing the course, the student will be able to:

CO1	Understand fundamentals concepts of python programming relevant to engineering computations
CO2	Apply Python libraries for handling engineering data and visualization.
CO3	Analyze engineering data for computational errors for civil engineering applications
CO4	Develop Python scripts for solving fundamental civil engineering problems.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	–	Marks awarded for weekly conduct of experiments and submission of laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	–	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 20 marks.
Total CIE Practical (A+B)	50	20	Sum of marks of experiments, record, and test shall be the CIE marks awarded for a maximum of 50.
SEE (C)	50	20	SEE is a laboratory examination conducted for 100 marks and scaled down to 50 marks. The examination duration shall be 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources

Text Books

1. Allen B. Downey, *Think Python: How to Think Like a Computer Scientist*, 2nd ed., O'Reilly Media, 2016.
2. Eric Matthes, *Python Crash Course*, 3rd ed., No Starch Press, 2023.
3. Reema Thareja, *Python Programming: Using Problem Solving Approach*, Oxford University Press, Latest Edition

Reference Books

1. Wes McKinney, *Python for Data Analysis*, 3rd ed., O'Reilly Media, 2022.
2. Jake VanderPlas, *Python Data Science Handbook*, O'Reilly Media, 2022.
3. John V. Guttag, *Introduction to Computation and Programming Using Python*, MIT Press, 2021.
4. Y. Daniel Liang, *Introduction to Programming Using Python*, Pearson Education, Latest Edition

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B.E. (Civil Engineering) Outcome-Based Education (OBE) and Choice-Based Credit System (CBCS)			
Course Title	**Community Project (Project-Based Learning) / Societal Project**		
Course Code	**25BCBPR308**	**Scheme**	**2025**
Type of Course	**SDC**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(0:0:0) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:0:30) 30 hrs/sem**	**SEE Marks**	**50**
Credits	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam Hours**	**03**

Course objective:

Rapid urbanisation, population growth, environmental concerns, energy demand, water scarcity, waste management, transportation issues and rural development challenges have created practical problems affecting communities and public welfare. This course aims to integrate technical knowledge, field exposure and societal engagement so that students identify real community issues, frame problem statements and attempt appropriate, feasible and sustainable engineering responses within the scope of a one-semester project.

Course outcome (Course Skill Set):

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

1. **CO1 (L2 – Understand):** Identify and analyse societal problems through field interaction and technical assessment.
2. **CO2 (L3 – Apply):** Develop skills in project planning, field survey, data collection, implementation, documentation and reporting.
3. **CO3 (L4 – Analyze):** Formulate feasible engineering problem statements and solutions considering practical constraints and sustainability aspects.
4. **CO4 (L3 – Apply):** Apply principles of environmental responsibility, ethics and societal welfare in engineering practice through community-oriented interventions.
5. **CO5 (L4 – Analyze):** Exhibit multidisciplinary learning and problem-solving ability based on collected data, user feedback and baseline conditions.
6. **CO6 (L5 – Evaluate):** Demonstrate teamwork and communication skills while interacting with technical and non-technical stakeholders and reflect on project impact on society.

Restrictions and professional conduct:

Community / Societal Projects shall remain **academic, socially responsible, technically focused, and politically neutral**. Students and faculty shall maintain professionalism, ethical conduct, public respect and institutional integrity while interacting with communities, public groups, organisations and stakeholders.

Students and faculty **shall avoid** the following during project execution:

- Association with political party activities, campaigns or propaganda.
- Participation in activities that may disturb communal harmony, public order or institutional reputation.
- Use of the project platform for personal, political, ideological or commercial promotion.
- Disrespectful, discriminatory or unethical interaction with community members or stakeholders.

Projects must also recognise constraints related to **cost, resources, environment and safety, and stakeholder behaviour/cooperation/acceptance** when planning and implementing activities.

Set of Project Activities (TW/SL = 30 hrs)

Methods for project identification:

Students may identify the project topic using one or more of the following methods:

- Interaction with local rural or urban stakeholders such as local leaders, corporation/municipality personnel, NGOs, panchayat representatives, etc.
- Review of issues highlighted in print and electronic media, and social networks (WhatsApp, Facebook, X, Instagram, etc.).
- After selecting a broad topic, students shall collect data, conduct a feasibility survey, estimate timelines and resources, approximate expenditure, and then define the problem statement and objectives clearly.

List of Project Topics and Engineering Outcomes:

The following structured sequence of activities is to be carried out during the semester:

Sl. No.	Project title	Measurable engineering outcome	Mapped POs	SDGs
1	Rural and urban water conservation and management systems	Prepare a site-specific water-saving plan, estimate water demand–supply gap, and propose a feasible conservation intervention with quantified savings.	PO1,PO2, PO3,PO4, PO10,PO11	SDG 6, SDG 11, SDG 12
2	Waste management and recycling	Conduct waste audit, classify waste streams, and design a segregation/recycling workflow with measurable reduction in mixed waste.	PO2,PO3, PO4,PO6, PO8,PO10	SDG 11, SDG 12, SDG 13

3	Afforestation	Identify a degraded area, prepare plantation layout, and demonstrate survival-rate tracking and maintenance schedule for saplings.	PO2,PO3, PO4,PO6, PO7,PO11	SDG 11, SDG 13, SDG 15
4	Biogas generation and power generation	Estimate organic waste availability, size a small biogas system, and document expected gas output or energy yield.	PO1,PO2, PO3,PO4, PO5,PO10	SDG 7, SDG 11, SDG 12
5	DPR for solar power rural plant	Prepare a DPR with load assessment, panel sizing, cost estimate, and projected energy generation and payback.	PO1,PO2, PO3,PO4, PO5,PO10	SDG 7, SDG 9, SDG 11
6	DPR for electrification of village/tribal community	Map unserved/underserved households, propose electrification layout, and estimate coverage, losses, and implementation cost.	PO1, PO2, PO3, PO4, PO10,PO11	SDG 7, SDG 9, SDG 10
7	DPR for rural drainage system	Survey drainage bottlenecks, develop a drainage layout, and estimate runoff handling capacity and flood-risk reduction.	PO1,PO2, PO3,PO4, PO6,PO10	SDG 6, SDG 9, SDG 11
8	Sustainability and environmental health projects	Assess local environmental health issues and propose interventions with measurable improvement in hygiene, safety, or resource use.	PO2,PO3, PO4,PO6, PO7,PO8	SDG 3, SDG 6, SDG 11, SDG 12
9	Plastic free campaigns	Measure plastic usage before and after awareness intervention and report percentage reduction or behavioural change.	PO2,PO3, PO6,PO7, PO8,PO10	SDG 11, SDG 12, SDG 13
10	Health and nutrition awareness	Conduct baseline and post-program awareness survey and document improvement in awareness score or adoption of healthier practices.	PO2,PO6, PO7,PO8, PO9,PO10	SDG 2, SDG 3, SDG 11
11	Societal projects involving health wellness	Identify a community health need and develop an awareness/service module with measurable participation and feedback outcomes.	PO2, PO3, PO6, PO8, PO9,PO10	SDG 3, SDG 11, SDG 17

12	Air quality monitoring system	Collect air-quality data, compare with reference limits, and present trends along with possible mitigation suggestions.	PO2, PO3, PO4, PO5, PO6,PO10	SDG 3, SDG 11, SDG 13
13	Plastic waste reduction campaign	Track collection, segregation, and replacement actions, and quantify reduction in plastic waste generation or littering.	PO2, PO3, PO6, PO7, PO8,PO10	SDG 11, SDG 12, SDG 13
14	Urban greening projects	Prepare greening plan, identify planting locations, and assess environmental benefits such as shade, aesthetics, or heat mitigation.	PO2, PO3, PO4, PO6, PO7,PO11	SDG 11, SDG 13, SDG 15
15	Smart agriculture solution	Design a low-cost monitoring or irrigation support solution and estimate improvement in water use efficiency or crop support.	PO1, PO2, PO3, PO4, PO5,PO10	SDG 2, SDG 6, SDG 9
16	Smart irrigation system	Estimate crop water requirement, propose control logic, and quantify water savings compared with conventional irrigation.	PO1, PO2, PO3, PO4, PO5,PO10	SDG 2, SDG 6, SDG 12
17	Youth mentoring programmes	Deliver a structured mentoring activity and measure participation, engagement, and skill/awareness improvement.	PO6, PO8, PO9, PO10, PO11	SDG 4, SDG 10, SDG 17
18	Adult education	Conduct learner-needs assessment, prepare instructional content, and measure improvement in basic literacy or numeracy indicators.	PO6, PO8, PO9, PO10, PO11	SDG 4, SDG 10, SDG 17
19	Food security initiatives / cold storage system	Estimate storage need, design a simple cold-chain concept, and document reduction in spoilage or wastage.	PO1, PO2, PO3, PO4, PO5,PO10	SDG 2, SDG 9, SDG 12
20	Human rights awareness with legal systems	Prepare and deliver an awareness module and assess increase in legal awareness and access-to-rights understanding.	PO6,PO7, PO8,PO9, PO10	SDG 5, SDG 10, SDG 16

21	House tax collection through digital media	Develop a simple digital workflow or awareness support and measure improvement in compliance, convenience, or response time.	PO2, PO3, PO4, PO5, PO10,PO11	SDG 9, SDG 11, SDG 16
22	Use of application / application program	Build or demonstrate a useful community app and measure usability, adoption, or efficiency improvement.	PO1, PO3, PO4, PO5, PO9,PO10	SDG 9, SDG 11, SDG 17
23	Creation of Panchayat library	Plan the library model, catalogue resources, and measure usage, accessibility, or participation outcomes.	PO6, PO8, PO9,PO10, PO11	SDG 4, SDG 10, SDG 11, SDG 17

Suggested Learning Resources:

Textbooks:

1. **Phadke, N. D**. Community Engagement and Social Innovation. 1st ed., Oxford University Press, New Delhi.
2. **Garg, N. R**. Project-Based Learning in Engineering Education. 1st ed., Pearson India Education Services, Noida.
3. **Gupta, A. and P. Singh.** Service Learning and Community Projects. 1st ed., McGraw-Hill Education (India), New Delhi.
4. **Wilson, G.** Practical Guide to Community Development Projects. 2nd ed., Routledge, London.

Reference books:

1. NPTEL courses on Project-Based Learning and Social Innovation.
2. SWAYAM courses on community engagement and sustainability.
3. UN Sustainable Development Goals portal: https://sdgs.un.org
4. MyGov India and local civic body portals for community initiatives.
5. YouTube resources on design thinking, social innovation, and community service learning.
6. NGO and government field-action case studies related to sanitation, water, health, education, and environment.

Web links and Video Lectures (e-Resources):

1. NPTEL courses on Engineering Geology (IIT Roorkee, IIT Kharagpur).
2. NPTEL courses on Soil Mechanics and Foundation Engineering (IIT Delhi, IIT Bombay).
3. Virtual Labs – Geotechnical Engineering Virtual Lab (IIT Kanpur): https://vlab.co.in
4. Geological Survey of India (GSI) – Maps, reports, and publications: https://www.gsi.gov.in
5. YouTube channels: Civil Engineering Essentials, The Engineering Classroom

(soil mechanics experiments).

6. American Society of Civil Engineers (ASCE) – Geotechnical resources and standards

Teaching Learning Process:

The suggested TLP for Community / Societal Project is as follows;

Week / Phase	Teaching–Learning Activity	Faculty Role	Student Activity	Output / Evidence
1	Course introduction, objectives, ethics, conduct, and assessment briefing	Explain course scope, rules, rubrics, and expected deliverables	Understand course requirements and form teams	Team list, course plan
2	Community problem identification and topic selection	Guide topic framing and feasibility	Identify local issues through discussion and observation	Shortlisted project topic
3	Stakeholder interaction and preliminary survey	Demonstrate survey methods and stakeholder engagement	Collect initial data from community/users	Survey notes, interview record
4	Problem statement and objective formulation	Review and refine problem statement	Prepare problem statement, scope, and objectives	Approved problem statement
5	Literature/case study review and baseline analysis	Suggest relevant references and examples	Study existing solutions and compare approaches	Baseline analysis summary
6	Project planning and role assignment	Help teams organize tasks, timeline, and responsibilities	Plan activities, divide roles, and prepare schedule	Work plan / Gantt chart
7	Feasibility analysis and solution brainstorming	Check technical feasibility and practicality	Generate possible engineering solutions	Solution alternatives sheet

8	Selection of final solution and design approach	Review final concept and design logic	Finalize concept, methods, and expected outcome	Concept note / design outline
9	Data processing / calculations / sizing / mapping	Support computations and technical review	Analyze data, perform calculations, prepare maps/charts	Technical analysis sheet
10	Prototype / model / audit / DPR / app development	Monitor progress and correct technical issues	Develop the selected output	Working model / draft DPR / map / app
11	Testing, refinement, and implementation planning	Evaluate technical correctness and improvements	Test prototype or validate proposal with users	Test results / revised output
12	Field implementation / demonstration / awareness activity	Facilitate community interaction and documentation	Conduct implementation or demonstration	Photos, attendance, implementation record
13	Documentation of outcomes, feedback, and impact	Review report structure and completeness	Compile findings, stakeholder feedback, and observations	Draft report
14	Presentation preparation and viva practice	Conduct mock presentation and feedback	Prepare slides/poster and rehearse	Presentation deck
15	Final presentation, submission, and reflection	Evaluate performance using rubrics	Present project, submit report, reflect on learning	Final report, presentation, viva

Assessment structure:

A. Continuous Internal Evaluation (CIE) – 50 marks

- Students, in batches of 3–4, shall undertake at least one project (or a combination of two related activities) aiming, as far as possible, at a logical implemented or implementable outcome.
- CIE will be conducted by a departmental committee (HoD/nominee, guide and one senior

faculty) using the following rubrics totalling 50 marks:

CIE pass requirement:

- A student shall secure a minimum of 20 marks out of 50 in CIE to become eligible to appear for SEE.
- Students who fail to earn the required CIE marks may be given additional opportunities before closure of the semester; no re-doing of CIE is permitted after the end of the semester.

B. Semester End Examination (SEE) – 100 marks (scaled to 50)

- Examination duration: 2 hours.
- Maximum examination marks: 100 (entered as 100 in the VTU portal; the ITI-SMU module automatically scales 100 → 50 for result processing).
- The SEE shall be conducted batch-wise by a committee of three faculty: project guide, one faculty from the same department and one from a different department.

SEE pass requirement and overall passing rule:

- For a pass in SEE, a student shall secure minimum 35 marks out of 100.
- For declaration of a pass grade, the sum of CIE marks (out of 50) and scaled SEE marks (out of 50) shall be ≥ 40; otherwise, the student is awarded grade F (Fail).

CIE Rubric — Continuous Internal Evaluation (Total 50 marks):

Criterion	Weight (marks)	Excellent (Full marks)	Good	Fair	Needs Improvement
Problem identification & Relevance to society/industry /community	8	Problem is clearly identified with strong evidence of societal relevance and well-defined scope.	Problem is relevant and scope is clear with adequate supporting evidence.	Problem defined but justification or evidence is weak.	Problem unclear or not relevant; little/no supporting evidence.
Formation of problem statement; Engineering approach, innovation & feasibility	10	Problem statement is precise; approach is sound, innovative and clearly feasible.	Problem statement adequate; approach feasible with minor gaps.	Problem statement partial; approach feasibility is marginal.	Problem statement missing or approach not feasible.

Interaction with stakeholders; Data collection, analysis & interpretation	8	Thorough stakeholder engagement; data collection is comprehensive; analysis is well interpreted	Good engagement; data and analysis adequate with minor gaps.	Limited engagement; data incomplete and analysis superficial.	Little/no stakeholder contact; insufficient or no data/analysis.
Project documentation; Clarity, organization & problem-solving demonstrated	10	Documentation is complete, well-organized, analytical, and shows strong problem-solving	Documentation complete and clear with some analytical content.	Documentation on basic with omissions; problem-solving limited.	Documentation missing/poorly organized; no clear problem-solving
Communication & Presentation skills	6	Presentation is confident, structured, and answers queries fully; visuals effective.	Presentation clear and satisfactory; responds to most queries.	Presentation acceptable but lacks clarity or confidence; weak responses.	Presentation poor or absent; unable to respond.
Contribution & Benefit to society (impact, sustainability)	8	Clear, demonstrable societal benefit and sustainability; realistic path to implementation	Benefit plausible; sustainability considered with minor gaps.	Limited or unclear societal benefit; sustainability not well addressed.	No evident benefit or sustainability; project not community-oriented.

Notes for CIE rubric:

- Minimum CIE pass requirement: 20/50 to be eligible for SEE. [Use departmental committee (HoD/guide + senior faculty) to apply the rubric and record marks.]

SEE Rubric — Semester End Examination (Enter marks out of 100; scaled to 50 later):

Criterion	Weight (marks)	Excellent (Full marks)	Good	Fair	Needs Improvement

Problem identification & Relevance to society/ industry/ community	16	Problem and relevance are articulated clearly with strong evidence and context.	Problem relevance clear with reasonable evidence.	Problem stated but evidence / context weak.	Problem poorly defined or irrelevant.
Formation of problem statement; Engineering approach, innovation & feasibility	20	Problem statement is precise; approach demonstrates engineering depth, novelty and feasibility.	Approach is technically sound and feasible with minor limitations.	Approac h basic; limited technical depth	No viable engineering approach or infeasible plan.
Interaction with stakeholders; Data collection, analysis & interpretation	16	Excellent stakeholder engagement; rigorous data collection and insightful analysis.	Good engagement and acceptable analysis.	Superfici al data collectio n and limited analysis.	Inadequate or no data; poor analysis.
Project documentation ; Clarity, technical rigor & problem-solving demonstrated	20	Report is comprehensive, technically rigorous, and demonstrates systematic problem-solving.	Report is complete and technically correct with minor gaps.	Report lacks technical depth or has notable omission s.	Report missing key elements or technically incorrect.
Communicatior Presentation & Viva-voce responses	12	Candidate presents expertly, defends work persuasively and answers all queries correctly.	Good presentation and satisfactory answers to most queries.	Presentat ion adequate but fails to answer some technical question	Poor presentation and unable to defend work.

Contribution & Benefit to society; Impact assessment & sustainability	16	Clear, evidence-based assessment of social impact and sustainability with scaling recommendations.	Reasonable impact discussion and sustainability considerations	Limited evaluation of impact	No coherent assessment of impact or sustainability

SEE pass rule:

- Student must secure at least 35/100 in SEE itself to be eligible for pass consideration.
- Final passing is based on CIE (out of 50) + SEE (scaled to 50) >= 40. Otherwise, grade F (Fail) is awarded.

Suggested implementation notes (for BoS / exam committees):

- Use numerical scores from the rubric and keep brief evaluator comments for each criterion.
- For team projects: record individual contribution within the documentation and adjust individual marks using a peer-evaluation sheet or guide's assessment.
- Maintain evidence (field notes, photos, questionnaires, DPRs, reports) as annexures for SEE moderation.
- Use standardized score sheet (spreadsheet) mapping rubric items to columns for easy aggregation and archival.

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B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**NSS-National Service Scheme**		
Course Code	**25BNSSP309**	**Scheme**	**2025**
Type of Course	**Non-Credit Mandatory Course (NCMC)**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(0:0:0)**	**CIE Marks**	**100**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:0:30)**	**SEE Marks**	**-**
Credits	**-**	**Total Marks**	**100**
Examination type	**-**	**Exam Hours**	**-**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Identify the needs and problems of the community and involve the problem–solving.
2. Develop among them a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
3. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Module-1
Introduction to NSS, Life Competencies, Youth Leadership and NSS
Module-2
Social connect and responsibilities.
Module-3
Activities -1 (Choose from Activity list)
Module-4
Activities -2 (Choose from Activity list)
Module-5
Activities -3 (Choose from Activity list)

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the motto and concepts of NSS
CO2	Develop overall personality of volunteers and make them as leaders and responsible citizens of our nation
CO3	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO4	Communicate effectively with the community and with the officials.

ACTIVITY LIST	
Plantation Drive: Adopt a Tree	Developing & managing an efficient garbage disposal system
Food Preservation/ Packaging awareness	Tourism Promotion: Innovative Approaches
Facilitating 100% digitized money transactions	Contribution to any national-level initiative of the Government of India. E.g. Digital India/ Skill India/ Swachh Bharat Internship etc.,

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
Evaluation based on Reports (A)	100	-	5 modules Reports, 5 modules X 10 M each = 50 M
Total CIE Theory (A)	**100**	**40**	
SEE (B)	**-**	**-**	**-**
CIE+SEE (A+B)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B**

- The minimum marks to be secured in CIE is 40 out of allotted 50 marks with minimum 40 % scored in every component of CIE.
- No SEE for this subject

Suggested Learning Resources:

Reference Books:

1) NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2) Government of Karnataka, NSS cell, activities reports and its manual.
3) Government of India, NSS cell, Activities reports and its manual.

Web links:

1) https://nss.gov.in/
2) https://pledge.mygov.in/

B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Physical Education**		
Course Code	**25BPEDU309**	**Scheme**	**2025**
Type of Course	**Non-Credit Mandatory Course (NCMC)**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(0:0:0)**	**CIE Marks**	**100**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:0:30)**	**SEE Marks**	**-**
Credits	**-**	**Total Marks**	**100**
Examination type	**-**	**Exam Hours**	**-**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Participate in the competition at regional/state / national / international levels.
4. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

Module-1

Orientation

A. Meaning and Importance of Physical Education
B. Lifestyle
C. Health & Wellness

Module-2

General Fitness & Components of Fitness

A. Meaning and Importance of Fitness
B. Warming up (Free Hand exercises)
C. Strength – Push-up / Pull-ups

Module-3

Specific games (Anyone to be selected by the student)

A. Kabaddi

a) Fundamental skills

Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.

b) Offensive Skills:

Raiding, Hand Touch, Toe Touch, Dubki, Squat Thrust

c) Defensive Skills:

Tackling, Ankle Hold, Thigh Hold, Waist Hold, Blocking, Chain Tackle

d) Other Important Skills:

Agility, Speed, Breath Control, Breath Holding

e) Rules and their interpretation and duties of the officials

B. Kho-Kho

a) Fundamental skills

Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.

b) Skills in Chasing:

Sit on the box (Parallel & Bullet toe method), Get up from the box (Proximal & Distal foot method), Give Kho (Simple, Early, Late & Judgment), Pole Turn, Pole Dive, Tapping, Rectification of foul.

c) Skills in running:

Chain Play, Ring play and Chain & Ring mixed play.

d) Game practice with application of Rules and Regulations.

e) Rules and their interpretations and duties of the officials.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
CO2	Familiarization of health-related Exercises, Sports for overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-----	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Quiz(B)	40	-----	Quiz for a maximum of 40 marks
Total CIE (A+B)	100	40	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Suggested Learning Resources:

Text books

1. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
2. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata.

Reference Books

1. Saraswati Health and Physical Education Textbook
2. V.K. Sharma's Health and Physical Education

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B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System			
Course Title	**Yoga**		
Course Code	**25BYOGA309**	**Scheme**	**2025**
Type of Course	**Non-Credit Mandatory Course (NCMC)**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(0:0:0)**	**CIE Marks**	**100**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:0:30)**	**SEE Marks**	**-**
Credits	**-**	**Total Marks**	**100**
Examination type	**-**	**Exam Hours**	**-**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Physical, Mental & spiritual Objectives of Yoga
2. Explain the meaning of Yoga.
3. Discuss the importance of the Yoga and its scope.
4. Describe the aims and objectives of Yoga.
5. Clarify the misconceptions on Yoga

Module-1

Orientation

a) Introduction of Yoga
b) Aim, and Objectives of Yoga,
c) Yoga, its origin, history and development.

Module-2

Yoga

a) Yoga, its meaning, definitions.
b) Brief introduction of yogic practices for the common man
c) Rules and regulations
d) Misconceptions of Yoga
e) Suryanamaskara

Module-3

Asanas

Types of Asanas:

a) **Sitting-**1. Padmasana, 2. Vajrasana
b) **Standing-**1. Vrikshana, 2. Trikonasana
c) **Prone line-**1. Bhujangasana 2. Shalabh asana
d) **Supine line-** 1. Utthita dvipadasana 2. Ardha halasana

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Yoga
CO2	Improves of health and related aspects, overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	----	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Quiz(B)	40	----	Quiz for a maximum of 40 marks
Total CIE (A+B)	100	40	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Text books

1. The Yoga Sutras of Patanjali – Sri Swami Satchidananda
2. Light on Yoga — B.K.S Iyengar

Reference Books

1. The Heart of Yoga — T.K.V Desikachar
2. "Asana Pranayama Mudra Bandha" by Swami Satyananda Saraswati

B.E. (Common to All the Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Music**		
Course Code	**25BMUK359**	**Scheme**	**2025**
Type of Course	**Non-Credit Mandatory Course (NCMC)**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(0:0:0)**	**CIE Marks**	**100**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:0:30)**	**SEE Marks**	**-**
Credits	**-**	**Total Marks**	**100**
Examination type	**-**	**Exam Hours**	**-**

Course Learning Objectives:

The purpose of the course is to facilitate the learner to:

1. Understand the origin, evolution, and fundamental concepts of Indian classical music.
2. Familiarize themselves with the basic forms of **Carnatic and Hindustani music compositions** and appreciate their musical structure and significance.
3. Identify and classify the major musical instruments used in **Carnatic and Hindustani music** and understand their construction and performance characteristics.
4. Recognize the contributions of eminent Indian composers and musicians to the development and preservation of Indian classical music.
5. Develop an appreciation for India's rich musical heritage, fostering creativity, cultural awareness, and lifelong interest in music.

Module-1		**3 hrs**
Origin of the Indian Music: Evolution of the Indian music system, Understanding of Shruthi, Nada, Swara, Laya, Raga Tala, Mela.		
Module-2		**3 hrs**
Compositions: Introduction to the few types of composition in Carnatic Music- Geethe, Swarajathi, Varna, Madhyama Kala Krithi,		
Module-3		**3 hrs**
Compositions: Introduction to the few types of composition in Hindustani Music : Khayal, Drupad, Tarana		
Module-4		**3 hrs**
Music Instruments: Classification and construction of string instruments, percussion instruments in both Carnatic and Hindustani Music.		
Module-5		**3 hrs**
Composers: Biography and contributions of the following eminent personalities Purandaradasa, Thyagaraja, Pt. Mallikarjun Mansur, Vidhushi Gangubhai Hangal		

Course Outcomes:

After successfully completing the course, the student will be able to:

CO1	Explain the origin, evolution, and fundamental concepts of Indian classical music. *(Bloom's Level: Understand – L2)*
CO2	Compare and distinguish the characteristics of selected Carnatic and Hindustani music compositions. *(Bloom's Level: Analyze – L4)*
CO3	Classify the major categories of Indian musical instruments and describe their construction and applications in Carnatic and Hindustani music. *(Bloom's Level: Analyze – L4)*
CO4	Examine the contributions of eminent Composers/Musicians and appreciate their role in preserving and promoting Indian classical music. *(Bloom's Level: Evaluate – L5)*

ASSESSMENT DETAILS (CIE and SEE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Experimental Work(B)	40	-	Submission of report on a topic related to music.
CIE + SEE (A+B)	**100**	**40**	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Text Books:

1.	Vidushi Vasantha Madhavi, "Theory of Music", Prism Publication, 2007.
2.	T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana- Vol. 1 (English), Shreenivaas Prakaashana, 2018.
3.	B. Chaitanya Deva, An Introduction to Indian Music, Publications Division, Government of India, New Delhi.

Reference Books:

1.	Lakshminarayana Subramaniam, Viji Subramanaim, "Classical Music of India: A Practical Guige, Tranqueber 2018.
2.	R. Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019,
3	Vamanrao H. Deshpande, Indian Musical Traditions: An Aesthetic Study of the Gharanas in Hindustani Music, Popular Prakashan, Mumbai.

B E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
ADDITIONAL MATHEMATICS – I (Mandatory Learning Course: Common to All Branches) (A Bridge course for Lateral Entry students under Diploma quota to BE/B. Tech.)			
Course Code	**25BMADP310**	**Scheme**	**2025**
Type of Course	**Non-Credit Mandatory Course (NCMC)**	**Semester**	**III**
Teaching Hours/Week (L:T:P)	**(14:0:0)**	**CIE Marks**	**100**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(14:0:0:14)**	**SEE Marks**	**-**
Credits	**PP**	**Total Marks**	**100**
Examination type	**-**	**Exam Hours**	**-**

COURSE LEARNING OBJECTIVES: The purpose of the course is to facilitate the learner to:

1. Apply the fundamental concepts of complex trigonometry, vector algebra, and differential and integral calculus to analyze mathematical and engineering problems.
2. Apply the principles of vector differentiation and solve first-order ordinary differential equations in relevant scientific and engineering contexts.

Module-1

Complex Trigonometry: Complex Numbers: Definitions and properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (without proof).

Vector Algebra: Scalar and vectors. Addition and subtraction and multiplication of vectors- Dot and Cross products, problems.

Module-2

Differential Calculus: Review of successive differentiation-illustrative examples. Maclaurin's series expansions-Illustrative examples. Partial Differentiation: Euler's theorem problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobians of order two-Problems.

Module-3

Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems.

Module-4

Integral Calculus: Review of elementary integral calculus. Reduction formulae for $\sin^n x$, $\cos^n x$ (with proof) and $\sin^m x \cos^n x$ (without proof) and evaluation of these with standard limits-Examples.

Module-5

Ordinary differential equations (ODE's. Introduction-solutions of first order and first-degree differential equations: exact, linear differential equations. Equations are reducible to exact and Bernoulli's equation.

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

CO1: Apply concepts of complex numbers and vector algebra to analyze the problems arising in related areas.

CO2: Apply derivatives and partial derivatives to calculate rate of change of multivariate functions.

CO3: Solve problems involving position, velocity, and acceleration in two and three dimensions using vector-valued functions.

CO4: Apply the fundamental techniques of elementary integration to solve standard integrals

CO5: Identify and solve first order ordinary differential equations.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-	Two tests of each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 60 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods of each of 20 marks as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 40 marks.
Total CIE (A+B)	**100**	**40**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**-**	**-**	No SEE for this subject
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				
1	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers	43rd Edition, 2015
Reference Books				
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition, 2015
2	Engineering Mathematics	N. P .Bali and Manish Goyal	Laxmi Publishers	7th Edition, 2007
3	Engineering Mathematics Vol. I	Rohit Khurana	Cengage Learning	1st Edition, 2015

Additional Mathematics I and II:

1. These courses are prescribed for III and IV semesters respectively to lateral entry Diploma holders admitted to III semester of B.E/B.Tech., programs. They shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the course requirements during subsequent semesters to earn the qualifying CIE marks. These courses are slated for CIE only and have no SEE.
2. Additional Mathematics I and II shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree.
3. Successful completion of the courses Additional Mathematics I and II shall be indicated as satisfactory in the grade card. Non-completion of the courses Additional Mathematics I and II shall be indicated as Unsatisfactory

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IV SEMESTER SUBJECTS

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Analysis of Structures**		
Course Code	**25BCVTH401**	**Scheme**	**2025**
Type of Course	**Professional Core Courses (PCC)**	**Semester**	**IV**
Teaching Hours/Week (L: T:P)	**(3:2:0) 75 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L: T:P: TW& SL)	**(45:30:0:45) 120 hrs/sem**	**SEE Marks**	**50**
Credits	**4**	**Total Marks**	**100**
Examination type	**Theory**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Understand the concepts of beam deflection, arches, cables, and influence lines in structural analysis.
2. Explain the principles of analytical, classical and matrix methods used for the analysis of statically determinate and indeterminate structures.
3. Apply the methods of structural analysis to determine the response of beams, arches, cables, frames, and trusses.
4. Analyze the behaviour of determinate and indeterminate structures under different loading conditions.

Module–1: Deflection of Beams **9 hrs**

Macaulay's Method: Introduction, Definitions — Slope, Deflection, Elastic Curve; Expression for the Equation of Flexure, Sign Convention. Determination of Slope and Deflection for Prismatic Beams — Simply Supported Beams, Cantilever Beams, and Overhanging Beams subjected to Point Loads, Uniformly Distributed Loads (UDL), and Couples.

Moment area method: Derivation, Mohr's theorems, sign convention; Application of moment area method to determinate prismatic beams, beams of varying cross section; Use of moment diagram by parts.

Module–2: Arches and Cables **9 hrs**

Arches: Concepts of normal thrust, radial shear and bending moment. Three-hinged Circular and Parabolic arches with support at the same and different levels.

Cables: Analysis of cables under point loads and UDL, Length of cables with supports at the same and different levels, Analysis of stiffening trusses for suspension cables.

Module–3: Influence Lines & Moving Loads **9 hrs**

Concepts of influence lines-ILD for reactions, SF and BM for determinate beams. Reactions, BM and SF in determinate beams, for rolling loads using ILD (Max. values and absolute max. values for beams subjected to multiple loads).

Module–4: Slope Deflection Method and Kani's Method **9 hrs**

Introduction to Various classical methods, Comparison of various classical methods.

Slope Deflection Method: Introduction, Analysis of continuous beams with and without support settlement, Analysis of orthogonal rigid plane frames with and without sway having kinematic indeterminacy ≤ 3.

Kani's Method: Introduction, Analysis of continuous beams with and without support settlement Analysis of frames with and without sway, Analysis of symmetric frames.

Module–5: Matrix Methods of Structural Analysis	**9 hrs**
Introduction: Comparison of Stiffness and Flexibility matrix methods. Stiffness Method (System Approach): Analysis of continuous beams, simple orthogonal frames with kinematic indeterminacy ≤ 3, and Analysis of plane trusses.	

Activity-Based Learning (30 hrs)	
Module	**Activity**
Module 1: Deflection of Beams	Beam Deflection Demonstration
Module 2: Arches and Cables	Arch and Cable Model
Module 3: Influence Lines & Moving Loads	Moving Load Demonstration
Module 4: Slope Deflection & Kani's Method	Joint Rotation and Member Deformation Activity
Module 5: Matrix Methods of Structural Analysis	Structural Connectivity and Stiffness Activity

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Identify the concepts of beam deflection, arches, cables, and influence lines used in structural analysis.
CO2	Explain the principles of beam deflection, influence lines, analytical, classical and matrix methods of structural analysis.
CO3	Determine the slope and deflection of beams, structural response of arches and cables, and maximum effects of moving loads using standard methods.
CO4	Analyze statically indeterminate beams, frames, and trusses using Slope Deflection Method, Kani's Method, and Matrix Stiffness Method

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE – IA Tests (A)	30	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 20 marks.

Total CIE (A+B)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	**50**	**18**	**SEE is a theory exam conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. S. S. Bhavikatti, *Structural Analysis – Vol. 1*, 6th ed. New Delhi, India: Vikas Publishing House Pvt. Ltd., 2016.
2. S. S. Bhavikatti, *Structural Analysis – Vol. 2*, 4th ed. New Delhi, India: Vikas Publishing House Pvt. Ltd., 2017.
3. S. Ramamrutham and R. Narayanan, *Theory of Structures*, 18th ed. New Delhi, India: Dhanpat Rai Publishing Company, 2014.

Reference books

1. H. S. Vishwanath and N. Dharmesh, *Analysis of Determinate Structures*, 1st ed. Bengaluru, India: Sapna Book House, 2020.
2. H. S. Vishwanath and N. Dharmesh, *Analysis of Indeterminate Structures*, 1st ed. Bengaluru, India: Sapna Book House, 2020.
3. C. S. Reddy, *Basic Structural Analysis*, 3rd ed. New Delhi, India: Tata McGraw-Hill Education, 2010.
4. R. C. Hibbeler, *Structural Analysis in SI Units*, 9th ed. Harlow, UK: Pearson Education, 2017.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Fluid Mechanics and Hydraulic Machines**		
Course Code	**25BCVIC402**	**Scheme**	**2025**
Type of Course	**Integrated Professional Core Courses (IPCC)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(3:0:2) 75 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(45:0:30:45) 120 hrs/sem**	**SEE Marks**	**50**
Credits	**4**	**Total Marks**	**100**
Examination type	**Theory- CIE +SEE & Lab- CIE only**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Understand the fundamental principles of kinematics, hydrodynamics and its applications on fluids flow.
2. Apply fluid mechanics principles for flow measurement.
3. Evaluate efficiency of hydraulic machineries.

Module–1: Fluid Mechanics, Fluid Pressure Measurement and Hydrostatics **9 hrs**

Fluid Mechanics: Definition- Basics of Fluid properties. Newton's law of viscosity, Classification of fluids, applications of Surface tension and Capillarity.
Fluid Pressure and measurement–Different types of Pressures, Pascal's Law and Hydrostatic Law, Manometers– Piezometer, U-Tube and Differential U-Tube manometers (No single column monometers) Applications of fluid mechanics in Civil Engineering
Hydrostatics: Total pressure and Centre of pressure on plane vertical, inclined surfaces.

Module–2: Fluid Kinematics and Dynamics **9 hrs**

Fluid Kinematics- Definition, Classification of fluid flow, Principle of Conservation of Mass - Continuity equation in Cartesian coordinates and One-Dimensional flow. Stream line and stream function
Fluid Dynamics- Equations of motion, Euler's equation and Bernoulli's equation of motion– Introduction to Flow Measurement devices- Venturimeter, Notches and Weirs, Introduction to Pitot tubes and its types.

Module–3:Flow Through Pipes **9 hrs**

Flow through Pipes: Introduction, Losses in pipe flow- Derivation of expressions for Major loss of energy due to friction. Minor Losses- Equations for Sudden contraction and sudden expansion in pipe system. Pipes in series - Compound pipe and Equivalent pipe, Pipes in parallel, Branched pipes. Concept of Hydraulic Gradient Line and Total Energy Line. Water hammer effect.

Module–4:Open Channel Flow **9 hrs**

Open Channel Flow: Introduction, Types of open channels, Uniform flow in channels - Chezy's formula, Manning's formula. Most economical channel sections- Rectangular, Triangular and Trapezoidal sections, Concepts of Specific energy & Critical flow- Specific energy curve, Rapidly Varied Flow (RVF), Hydraulic jump in rectangular channels.

Module–5:Turbines and Pumps **9 hrs**

Impact of jet on vanes: Introduction, Impulse-Momentum equation. Direct impact of a jet on

stationary and moving curved vanes, Introduction to concept of velocity triangles **Hydraulic Machines:** Pelton, Kaplan-Working principles, Construction, Performance characteristics, Specific speed, Head, and Discharge considerations. **Pumps:** Centrifugal, Construction, Performance characteristics **Hydropower:** Hydroelectric power plants, layout, and features

PRACTICAL COMPONENT OF IPCC

Sl. No.	Experiments (30 hrs)
1	Verification of Bernoulli's equation
2	Calibration of Venturimeter
3	Calibration of Orifice meter
4	Calibration of triangular notch
5	Calibration of Rectangular notch
6	Determination of hydraulic coefficients of small vertical orifice
7	Determination of major losses in pipes
8	Determination of efficiency of jet on flat and curved vanes
7	Demonstration on efficiency of centrifugal pump
9	Demonstration on efficiency of Francis/Kaplan turbine
10	Demonstration on efficiency of Pelton wheel

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental principles of fluids Mechanics
CO2	Apply principles of fluid kinematics and dynamics for flow measurements
CO3	Analyze characteristics of flow through pipes and channels
CO4	Evaluate the efficiency of hydraulic machineries.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.

Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.

Total CIE Practical (C)	**20**	**8**	Marks of Experiments, Record and Test awarded for a maximum of 20 marks.
CIE: Theory + Practical (A + B + C)	**50**	**20**	CIE Evaluation is done for a maximum of 50 marks.
SEE (D)	**50**	**18**	SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.
CIE+SEE (A+B+C+D)	**100**	**40**	Final marks shall be the sum of marks scored in Components A, B, C and D

- The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for
SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only

Suggested Learning Resources:

Textbooks

1. P. N. Modi and S. M. Seth, **"**Hydraulics and Fluid Mechanics", 22nd ed., Standard Book House, 2019.
2. R. K. Bansal, "Fluid Mechanics and Hydraulic Machines", 11th ed., Laxmi Publications, 2019.
3. C. S. P. Ojha, P. N. Chandramouli, and R. Berndtsson, **"**Fluid Mechanics and Machinery", Oxford University Press, 2010.
4. A. Yunus Çengel and M. John Cimbala, "Fluid Mechanics fundamental and applications", 3rd ed., McGraw-Hill, 2013.
5. M. Frank White, "Fluid Mechanics", 7th ed., McGraw-Hill, 2011.

Reference books

1. K. Subramanya, "Fluid Mechanics", Tata McGraw Hill, 2019.
2. L. Victor Streeter, E. Benjamin Wylie and W. Keith Bedford, "Fluid Mechanics", Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2008.

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Engineering Survey**		
Course Code	**25BCVIC403**	**Scheme**	**2025**
Type of Course	**Integrated Professional Core Course (IPCC)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(3:0:2) 75 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(45:0:30:45) 120 hrs/sem**	**SEE Marks**	**50**
Credits	**4**	**Total Marks**	**100**
Examination type	**Theory- CIE +SEE & Lab-CIE only**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Understand the fundamental principles, classifications, and applications of conventional surveying techniques used in civil engineering.
2. Explain the working principles and applications of surveying instruments, including chain, compass, plane table, level, theodolite, and Total Station.
3. Describe the modern surveying technologies in solving problems on surveying practices.
4. Evaluate linear and angular measurements using various surveying techniques.

Module–1: **9 hrs**

Engineering surveying – Definition, principles, objectives and importance of surveying for Civil Engineers. Surveying types- Control survey, Topographical surveying, Construction Survey, Cadastral survey, Hydrographic survey and Underground Survey. Surveying through the ages- **Chain surveying**, Definition and types of chains and direct ranging using chain.

Compass surveying, Basic definitions; meridians, bearings, magnetic and True bearings. Prismatic and surveyor's compasses, temporary adjustments. Quadrantal bearings, whole circle bearings, local attraction and related problems.

Plane Table Surveying: plane table and accessories, advantages and disadvantages of plane table survey, method of plotting - radiation, intersection method.

Module–2: **9 hrs**

Measurement of Distance- Various types of tapes, Laser distance meter, Distance measuring wheel, Electronic Distance measurement, GPS.

Levelling – Principles and Terms used in levelling – Types of Levels – Types of adjustments and objectives – Types of levelling – Simple, Differential, Fly, Reciprocal, Booking of levels – Rise & fall and H. I methods.

Theodolite Surveying – Terms used in Theodolite surveying. Setting up a Theodolite. Measurement of Horizontal and Vertical angle measurements by repetition and reiteration.

Module–3: **9 hrs**

Introduction Total Station– Features, parts, accessories and advantages of Total Station. Measurement of coordinates using total station. Creating Job files, importance of back sight data, coordinate data recording. Data transferring, data refinement and plotting in CAD.

Liner and angular measurements using Total station – Measurement of Horizontal angle, vertical angle, horizontal distance, slope distance, vertical distance and area using Total station.

Longitudinal and cross sectioning – Definition, importance of L/S & C/S. L/S & C/S using level, and Total station. Plotting of L/S & C/S in CAD.

Contours - Definition terms used, characteristics of contours and applications of contours in civil engineering practice. Contouring using direct and indirect method. Plotting of contours in CAD.
Module–4: **9 hrs**
Curves –Types of Curves- Application of Horizontal curve and vertical curves in civil engineering. Setting out simple by Rankine's method, Transition Curve using Total Station. Components of Compound, Reverse curve and Combined curve. **Areas and Volumes-** Methods of determining areas by trapezoidal and Simpsons' rule. Measurement of volume by Prismoidal and trapezoidal formula. Earthwork volume calculations from spot levels and from contour maps. **Construction Surveying -** Setting out works using Total Station, Setting out buildings by Centre line method.
Module–4: **9 hrs**
Survey map: Study of Topo sheets and applications **Modern Surveying Instruments–** LIDAR (Light Detection and Ranging), Introduction, applications and advantages. Principles of GPS & GNSS (Global Navigation Satellite Systems), Applications, advantage and disadvantages of Drone surveying. Principles and components of DGPS, correction techniques for improving positioning accuracy. Applications of DGPS in surveying, mapping, navigation, and geospatial data collection. **Remote sensing and GIS:** Application and uses of Remote sensing and GIS in engineering surveying.

PRACTICAL COMPONENT OF IPCC	
Sl. No.	**Experiments (30 hrs)**
1	Demonstration of Equipment's used for chain, compass and plane table surveying.
2	Use of Various types of tapes, Laser distance meter, Distance measuring wheel.
3	Differential levelling by Dumpy level by plane of collimation method
4	Measurement of horizontal and vertical angles by Theodolite. Method of repetition
5	Setting up of Total station. Features and components of Total station
6	Measurement of Distance, slope, vertical distance, horizontal and vertical angles using Total Station, Coordinate measurement with Total station
7	Longitudinal sectioning and cross sectioning using Dumpy level and Total station.
8	Setting out simple curve using Rankine's method using Total station.
9	Setting out central line of a small residential building.
10	Determination of precise coordinates of selected ground control points using DGPS and comparison with conventional GPS measurements.
11	Conduct a DGPS survey to collect field coordinates and prepare a site map, evaluating positional accuracy and correction effectiveness.
12	Visit to railway station/ large construction site to understand the importance of datum and benchmark.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Describe the principles, classifications, and applications of conventional surveying methods used in civil engineering.
CO2	Apply modern surveying and geospatial technologies for solving problems on surveying applications.
CO3	Analyse survey data and mapping techniques for surveying project planning.
CO4	Evaluate linear and angular measurements in surveying.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	**20**	**8**	**Marks of Experiments, Record and Test awarded for a maximum of 20 marks.**
CIE: Theory + Practical (A + B + C)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (D)	**50**	**18**	**SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE+SEE (A+B+C+D)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B, C and D**
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only

Suggested Learning Resources:

Textbooks

1. Punmia BC, & Jain Ashok Kumar. (2016). *Surveying* (17th ed., Vol. 1). Laxmi Publications.
2. Dr. K.R. Arora. (2019). *Surveying* (17th ed., Vol. 1). Standard Book House.
3. Charles D. Ghilani. (2012) (13th ed.). Prentice Hall.

Reference books

1. G. Singh & J. Singh (2024), Surveying, *ISBN: 978-81-7409-288-5, 12th ed*, Khanna Publishers.
2. R. Agor (1991), *ISBN: 978-81-7409-268-7, 5th ed*, Khanna Publishers.
3. Dr A M Chandra (2005), Surveying, *ISBN (13), 978-81-224-2532-1*, New Age International (P) Ltd., Publishers.
4. W. Schofield (1984), Engineering Surveying, *ISBN:978-0-408-01227-0, Third Edition*, Elsevier Ltd.

ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome-Based Education(OBE) and Choice-Based Credit System(CBCS)			
Course Title:	**Engineering Geology**		
Course Code:	**25BCVIC404**	**Scheme**	**2025**
Type of Course	**Professional Core Courses (PCC)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(3:0:2) 75 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(45:0:30:45) 120 hrs/sem**	**SEE Marks**	**50**
Credits	**4**	**Total Marks**	**100**
Examination type	**Theory- CIE +SEE & Lab-CIE only**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the fundamental principles of physical geology, mineralogy, and tectonics relevant to civil engineering.
2. Identify various types of rocks, weathering effects, and soil formations, and relate them to their suitability for construction.
3. Explain the processes of groundwater movement and the geophysical methods for subsurface water exploration.
4. Apply geological investigation techniques to evaluate the safety and suitability of engineering project sites.

Module-1: Fundamentals of Geology and Tectonics **9 hrs**

Introduction: Geology and its significance in Civil Engineering, Earth's Structure and Composition. Geological Time Scale. Tectonic Activities: Types, Causes, Isoseismic Lines, and Seismic Zonation of India.

Mineralogy: Physical properties, Identification of important Rock-forming minerals and economic minerals.

Module-2: Earth Materials and their Engineering Significance **9 hrs**

Petrology: Rock Cycle, Formation, Classification of Igneous, Sedimentary, Metamorphic Rocks. Engineering Properties of Rocks and Their Suitability in Construction.

Weathering: Types and Causes. Influence of Weathering on Civil Engineering Structures. Soil Profile, Indian Soil Groups. Soil Erosion: Prevention and Control.

Module-3: Hydrogeology **9 hrs**

Hydrological Cycle, Zonal Distribution of Subsurface Water, Water-Bearing Qualities of Rocks. Types of Aquifers, Aquifer Functions: Porosity, Specific Yield, Specific Retention, Permeability, Darcy's Law, Coefficient of Permeability.

Groundwater Exploration: Introduction to Geophysical Exploration, Seismic Method, Electrical Resistivity Method.

Module-4: Structural Geology and Rock Deformation **9 hrs**

Deformation in Rocks, Dip and strike (numerical), Faults, Folds, Unconformity, Joints: Classification, Recognition. Causes. Engineering Importance of Geological Structures. Determining the thickness of strata. (numerical)

Module-5: Geological Investigations for Civil Engineering Projects **9 hrs**

Geological Investigation: Methods of Investigation: Surface Investigation, Subsurface Investigation. Interpretation of borehole data, Rock Quality Designation (RQD), and Rock

Structure Rating (RSR). Geological investigations for site selection of dams, reservoirs, tunnels, bridges, and highways, including case studies on each construction type.

PRACTICAL COMPONENT OF IPCC

Sl. No.	Experiments (30 hrs)
1	Evaluation of minerals based on physical properties for basic raw material for
2	Identification of rock based on physical, textural, and mineralogical properties for construction
3	Interpretation and drawing of sections for geological maps: Horizontal and Inclined series
4	Interpretation of geological maps and preparation of cross-sections in **folded strata** for engineering applications.
5	Interpretation of geological maps and preparation of cross-sections in **faulted strata** for engineering applications.
6	Interpretation of geological maps and preparation of cross-sections in **unconformity sequences** for engineering applications.
7	Demonstration of the Electrical Resistivity Method for groundwater exploration and interpretation of lateral profiling and vertical electrical sounding data.
8	Demonstration of the Electrical Resistivity Method for bedrock and soil identification
9	Study and identification of rocks, geological structures, weathering profiles, and engineering geological features at the local field location. Preparation and submission of a field observation report.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the fundamental principles of physical geology, mineralogy, and tectonics relevant to Civil Engineering
CO2	Describe various types of rocks, weathering effects, and soil formations, and relate them to their suitability for construction.
CO3	Apply geophysical methods for groundwater movement studies and subsurface water exploration.
CO4	Utilize geological investigation techniques to assess the safety and suitability of engineering project sites.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE- IA Tests (A)	20	-	Two tests each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 20 marks.
Continuous and Comprehensive Evaluation (B)	10	-	Any one Assessment methods as per 24RNBE4.2 scaled to 10 marks.
Total CIE Theory (A+B)	**30**	**12**	**Marks of Tests and Assignments awarded for a maximum of 30.**
CIE Practical	12	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 12 marks.
CIE Practical Test	8	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 8.
Total CIE Practical (C)	**20**	**8**	**Marks of Experiments, Record and Test awarded for a maximum of 20 marks.**
CIE: Theory + Practical (A + B + C)	**50**	**20**	**CIE Evaluation is done for a maximum of 50 marks.**
SEE (D)	**50**	**18**	**SEE is a theory exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE+SEE (A+B+C+D)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B, C and D**
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included in their respective modules only			

Suggested Learning Resources:

Text Books:

1. Parbin Singh, Engineering Geology and General Geology, 10th ed, Katson Educational Series,2018.

2. Bangar K M, Principles of Engineering Geology, 3rd ed, Standard Publishers Distributors,2023
3. Gokhale K V G V, Principles of Engineering Geology, 3rd ed, B S Publication,2023.

Reference Books:

1. Mukerjee P K, A Textbook of Geology (13th ed), The World Press Private Limited,2015.
2. Mahapatra G B, Textbook of Physical Geology (1st ed), CBS Publishers and Distributors Pvt Ltd,2018.
3. Billings Marland, Structural Geology, 3rd ed, Pearson Education, 2016.
4. Attwell P.B, Farmer I.W, Principles of Engineering Geology, 1st ed, Springer,2011.

RNS
ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Domestic Plumbing and Electrical Wiring Lab**		
Course Code	**25BCVLB405**	**Scheme**	**2025**
Type of Course	**Professional Core Course Laboratory (PCCL)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(0:0:2) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:30:0) 30 hrs/sem**	**SEE Marks**	**50**
Credits	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand basic plumbing systems and electrical wiring.
2. Prepare line diagram for electrical and plumbing work for residential building.
3. Construct plumbing and electrical wiring for residential building.

Sl. No.	Experiments
1	Plumbing Works: Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
2	Study of pipe connections requirements for pumps and turbines.
3	Preparation of plumbing line sketches for water supply and sewage works.
4	Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5	Demonstration of plumbing requirements of high-rise buildings.
6	Electrical Work: Measurement of electrical quantities-voltage current, power & power factor in RLC circuit.
7	Preparation of Electrical line sketches, Residential house wiring using fuse, switch, indicator, lamp and energy meter.
8	Measurement of energy using single phase energy meter.
9	Measurement of resistance to earth of electrical equipment.
10	Fluorescent lamp wiring, Stair case wiring.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understanding basic plumbing fittings and their uses in household pipelines.
CO2	Draw simple line diagrams for electrical and plumbing systems in a residential building.
CO3	Construct basic plumbing and electrical wiring layouts for a residential building following standard practices.

ASSESSMENT DETAILS (Both CIE and SEE)

1-Credit Lab Course			
Assessment Type	**Maximum Marks**	**Minimum Passing Marks**	**Evaluation Details**
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
• The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain "Building Construction" 11th ed., 2021.
2. S. L. Uppal "Electrical Wiring Estimating and Costing" 6th ed., 2025, Khanna Publishers, New Delhi.

Reference books

1. B. Raina & S. K. Bhattacharya "Electrical Design (Estimating and Costing)" 2nd ed., 2024 – New Age International Publisher.
2. S. K. Garg "Water Supply Engineering" 33rd Revised ed., 2019.

RNS
ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**AI Tools Lab for Civil Engineering**		
Course Code	**25BCVAE406A**	**Scheme**	**2025**
Type of Course	**Ability Enhancement Course (AEC) Laboratory**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(0:0:2) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:30:0) 30 hrs/sem**	**SEE Marks**	**50**
Credits	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Understand the fundamentals of AI and its applications in Civil Engineering.
2. Apply AI tools for solving basic problems in structural analysis, concrete technology, and construction materials.
3. Analyze Engineering data and interpret results using AI-assisted platforms.
4. Create technical reports, presentations, and simple AI-based building plan for Civil Engineering applications.

Sl. No.	Experiments (30 hrs)
1	Introduction to AI tools and prompt engineering using ChatGpt, Gemini, Claude, Wolfram Alpha, Microsoft Copilot, Zotero and Note book LM.
2	AI-based classification of construction materials using physical property datasets.
3	AI-assisted preparation of tender documents, including Notice Inviting Tender (NIT), Bill of Quantities (BOQ), and technical specifications.
3	Solving and verifying reactions of beams and trusses using AI tools.
4	AI-based visualization of shear force and bending moment diagrams.
5	Predicting compressive strength of concrete using sample datasets.
6	AI-assisted mix proportion analysis and comparison of different concrete grades.
7	Automated preparation of laboratory reports, presentations, and technical posters.
8	AI assisted building plan, elevation drawings for area, requirements of the structure given.
9	AI-assisted interpretation and summarization of Civil Engineering codes and standards.
10	Mini Project

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Demonstrate the use of AI tools and prompt engineering techniques for Civil Engineering applications.
CO2	Apply AI tools to solve and verify problems related to structural analysis and concrete technology.
CO3	Analyze Engineering datasets and develop simple AI-based solutions for material classification, and strength prediction.
CO4	Create professional technical reports, Presentations and visualizations using AI tools.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	–	Marks awarded for weekly conduct of experiments and submission of laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	–	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 20 marks.
Total CIE Practical (A+B)	50	20	Sum of marks of experiments, record, and test shall be the CIE marks awarded for a maximum of 50.
SEE (C)	50	20	SEE is a laboratory examination conducted for 100 marks and scaled down to 50 marks. The examination duration shall be 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. M. A. Jayaram, *Artificial Intelligence and Applications in Core Engineering*, 1st ed. New Delhi, India: PHI Learning Pvt. Ltd., 2024.

2. M. Gupta and M. Malik, *Artificial Intelligence for Engineers*, 1st ed. New Delhi, India: S. K. Kataria & Sons, 2022.

Reference books

1. R. Chopra, Generative AI Tools and Applications, 1st ed., New Delhi, India: BPB Publications, 2023.

2. S. Sumathi and S. Esakkirajan, Fundamentals of Artificial Intelligence. New Delhi, India: New Age International Publishers, 2007.

RNS
ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome-Based Education (OBE) and Choice-Based Credit System (CBCS)			
Course Title:	**DGPS and QGIS Lab**		
Course Code:	**25BCVAE406B**	**Scheme**	**2025**
Type of Course	**Ability Enhancement Course (AEC) Laboratory**	**Semester**	**IV**
Teaching Hours/Weeks (L:T : P)	**(0:0:2) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:30:0) 30 hrs/sem**	**SEE Marks**	**50**
Credits:	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the fundamentals of Global Navigation Satellite Systems (GNSS), Differential Global Positioning System (DGPS), and Geographic Information Systems (GIS).
2. Develop practical skills in collecting accurate geospatial data using DGPS equipment.
3. Apply QGIS tools for spatial data visualization, editing, thematic mapping, and basic geospatial analysis.
4. Create engineering maps and interpret spatial information for solving civil engineering problems.

Sl. No.	Experiments
1	Introduction to GNSS and DGPS, familiarization with DGPS equipment, satellite initialization, coordinate systems, and field safety procedures.
2	DGPS field survey for collection of Point Features, recording coordinates, waypoint management, and assessment of positional accuracy.
3	DGPS field survey for collection of Line and Polygon Features, data logging, and exporting survey data to compatible GIS formats.
4	Downloading, importing, and pre-processing DGPS survey data for GIS applications, including understanding Coordinate Reference Systems (CRS) and map projections.
5	Introduction to QGIS, loading raster and vector datasets, layer management, visualization, attribute table editing, and creation of vector layers.
6	Digitization of spatial features using point, line, and polygon layers, feature editing, symbology, labelling, and thematic map preparation.
7	Spatial data analysis using geo processing tools such as Buffer, Clip, Merge, Dissolve, Intersection, and measurement of distance and area.
8	Preparation of map layouts incorporating standard cartographic elements such as title, legend, north arrow, scale bar, coordinate grid, and export of maps.

9	Mini Project: Integration of DGPS field data with QGIS for campus mapping or a basic civil engineering application, including data visualization, spatial analysis, and thematic map preparation.

COURSE OUTCOMES:

After completing the course, the student will be able to:

CO1	Demonstrate the ability to operate DGPS equipment for collecting accurate geospatial data required for civil engineering applications.
CO2	Apply QGIS tools to manage, visualize, edit, and organize spatial datasets using appropriate GIS techniques.
CO3	Analyze geospatial data using basic geoprocessing and thematic mapping techniques to solve introductory civil engineering problems.
CO4	Develop professional-quality engineering maps by integrating DGPS survey data with QGIS and applying standard cartographic principles.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	–	Marks awarded for weekly conduct of experiments and submission of laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	–	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 20 marks.
Total CIE Practical (A+B)	50	20	Sum of marks of experiments, record, and test shall be the CIE marks awarded for a maximum of 50.
SEE (C)	50	20	SEE is a laboratory examination conducted for 100 marks and scaled down to 50 marks. The examination duration shall be 3 hours.
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Text Books

1. Satheesh Gopi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education, Latest Edition.

2. M. Anji Reddy, Textbook of Remote Sensing and Geographical Information Systems, BS Publications, Latest Edition.
3. QGIS Documentation Team, QGIS Training Manual, Open Source Geospatial Foundation (OSGeo), Latest Edition.

Reference Books

1. Kurt Menke, G. Smith, L. Pirelli, and J. Van Hoesen, Mastering QGIS, Locate Press, Latest Edition.
2. Anita Graser, Learning QGIS, Packt Publishing, Latest Edition.
3. Erik Westra, Building Mapping Applications with QGIS, Packt Publishing, Latest Edition.
4. Paul R. Wolf and Charles D. Ghilani, Elementary Surveying: An Introduction to Geomatics, Pearson Education, Latest Edition.
5. Bernhard Hofmann-Wellenhof, Herbert Lichtenegger, and Elmar Wasle, GNSS – Global Navigation Satellite Systems: GPS, GLONASS, Galileo & More, Springer, Latest Edition.

ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Water Distribution Network Modelling With EPANET Lab**		
Course Code	**25BCVAE406C**	**Scheme**	**2025**
Type of Course	**Ability Enhancement Course (AEC) Laboratory**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(0:0:2) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:30:0) 30 hrs/sem**	**SEE Marks**	**50**
Credits	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the components and operation of water distribution systems.
2. Analyze the hydraulic behaviour of pipe networks under varying operating conditions.
3. Evaluate the performance of storage reservoirs, pumps, valves, and water demand patterns in distribution systems.
4. Develop water supply network models using EPANET for hydraulic analysis.

Sl. No.	Set of Experiments (30 hrs)
1	Introduction to EPANET Interface: Introduction to EPANET software, explore interface (toolbars, nodes, links), create a simple network, units (reservoir, junctions, pipes, values, tanks).
2	Basic Hydraulic Network Modelling: Create a network with pipes and junctions, assign elevations and base demands, define pipe properties (length, diameter, roughness), Run hydraulic simulation.
3	Analysis of Looped Distribution Network: Develop a looped water distribution network, assign hydraulic parameters, run simulation and observe flow distribution, analyse pressure variation.
4	Head Loss Analysis: Assign varying pipe diameters and roughness values, run simulation, compare head loss across different pipes.
5	Extended Period Simulation (EPS): Define demand patterns, set simulation duration, run EPS analysis, observe variation of parameters over time.
6	Pump Curves and Patterns Modelling: Add pump to the network, define pump characteristics/curve, introduce valves (PRV/FCV), Apply control settings and run simulation.

7	Water Quality simulation basics: Constituent setup, reaction coefficients, and tracing a conservative tracer.
8	Leak/closed pipe and Scenario: Introduce leakage at selected nodes, simulate system before and after leak, closure, identify alternate flows and critical links
9	Model calibration exercise: Compare simulated vs provided field pressures/flows, adjust demands or roughness to improve fit.
10	Case Study / Mini Project: Model a real or hypothetical water distribution system, perform demand and supply analysis, optimize pipe sizing or network design, evaluate system performance under varying conditions

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Explain the components and operational principles of water distribution systems.
CO2	Analyze pressure, flow, velocity, and head loss in water distribution pipe networks.
CO3	Assess the performance of storage reservoirs, pumps, valves, and demand patterns in water distribution systems.
CO4	Develop hydraulic models of water distribution networks using EPANET.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	–	Marks awarded for weekly conduct of experiments and submission of laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	–	Average of marks of two tests, each conducted for 100 marks covering all experiments, scaled to 20 marks.
Total CIE Practical (A+B)	50	20	**Sum of marks of experiments, record, and test shall be the CIE marks awarded for a maximum of 50.**

SEE (C)	50	20	**SEE is a laboratory examination conducted for 100 marks and scaled down to 50 marks. The examination duration shall be 3 hours.**
CIE + SEE (A+B+C)	100	40	Final marks shall be the sum of marks scored in Components A, B, and C.
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Text Books

1. Rossman, L. A. EPANET 2 User's Manual / EPANET technical documentation. This is the core reference for hydraulic and water quality modelling in EPANET.
2. Walski, T. M., et al. Advanced Water Distribution Modeling and Management. A useful reference for network analysis, calibration, and operational studies.

Reference Books

1. Mays, L. W. Water Distribution Systems Handbook. Helpful for design principles, pressure management, and system planning.
2. AWWA manuals and selected civil engineering water supply texts for distribution network fundamentals and practical design guidance.

ESTD:2001
An Institute with a Difference

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**MATLAB Applications for Civil Engineering**		
Course Code	**25BCVAE406D**	**Scheme**	**2025**
Type of Course	**Ability Enhancement Course (AEC) Laboratory**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(0:0:2) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:30:0) 30 hrs/sem**	**SEE Marks**	**50**
Credits	**1**	**Total Marks**	**100**
Examination type	**Practical**	**Exam Hours**	**3**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to enable the learner to:

1. Understand the MATLAB environment, programming fundamentals, and computational tools used in engineering applications.
2. Apply MATLAB programming constructs and numerical techniques for solving engineering problems.
3. Analyze engineering data using statistical methods, visualization techniques, and regression models.
4. Integrate MATLAB tools for civil engineering computations and data-driven applications.

LIST OF EXPERIMENTS

Sl. No.	Experiments
1	Introduction to MATLAB Environment: Familiarization with the MATLAB interface, variables, data types, operators, and built-in functions.
2	Vectors and Matrix Operations: Creation and manipulation of vectors and matrices using MATLAB matrix functions.
3	Decision Making and Loops: Implementation of if, switch, for, and while statements for program control.
4	Curve fitting & regression – fit material/load data and generate trendlines and design charts
5	Solving Linear Systems: Solution of systems of linear equations using matrix operations and MATLAB built-in functions.
6	Data Import and Statistics: Importing Excel/CSV data and performing basic statistical analysis.
7	Data Visualization: Creating and customizing 2D plots, bar charts, histograms, and scatter plots.
8	Curve Fitting and Regression: Performing polynomial fitting, interpolation, and linear regression.

9	Numerical Methods: Solving engineering problems using root finding, interpolation, differentiation, and integration.
10	Mini Project: Development of a simple MATLAB application for a civil engineering problem.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Describe MATLAB programming fundamentals and computational tools.
CO2	Implement MATLAB techniques for engineering computations.
CO3	Examine engineering data using statistical and visualization techniques.
CO4	Integrate MATLAB tools for civil engineering applications.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE Practical (A)	30	-	Marks awarded for Weekly Conduction of Experiments and Submission of Laboratory records, scaled to 30 marks.
CIE Practical Test (B)	20	-	Average of marks of Two tests, each conducted for 100 marks covering all experiments, scaled to 20.
Total CIE Practical (A+B)	**50**	**20**	**Sum of Marks of Experiments, Record and Test shall be CIE marks awarded for a maximum of 50.**
SEE (C)	**50**	**20**	**SEE is a lab exam, conducted for 100 marks and scaled down to 50 marks. Exam duration shall be 3 hours.**
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**
The minimum marks to be secured in CIE is 20 (40%) out of allotted 50 marks to appear for SEE.			

Suggested Learning Resources:

Textbooks

1. R. Pratap, *Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers*. New York, NY, USA: Oxford University Press, 2010.
2. R. Pratap, *MATLAB 7 for Engineers*. New York, NY, USA: Oxford University Press, 2006.
3. B. M. K. Babu, *MATLAB Programming with Applications to Engineering*. Chennai, India: Scitech Publications (India), 2006.

Reference books:

1. W. Palm III, *MATLAB for Engineering Applications*. New York, NY, USA: McGraw-Hill, 2018.
2. D. M. Smith, *Engineering Computation with MATLAB*, 3rd ed. Boston, MA, USA: Pearson, 2013.

ESTD:2001
An Institute with a Difference

B.E. (Common to all branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Biology for Engineers**		
Course Code	**25BFETH407**	**Scheme**	**2025**
Type of Course	**Basic Science Course (BSC)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(2:0:0) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(2:0:0:2) 60 hrs/sem**	**SEE Marks**	**50**
Credits	**2**	**Total Marks**	**100**
Examination type	**Theory- MCQs**	**Exam Hours**	**2**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Familiarize the students with the basic biological concepts and their engineering applications.
2. Enable the students with an understanding of bio-design principles to create novel devices and structures.
3. Provide the students with an appreciation of how biological systems can be re-designed as substitute products for natural systems.
4. Motivate the students to develop interdisciplinary vision of biological engineering.

Module-1	**5 hrs**
Introduction to fundamentals of life: Structure and functions of a cell. Biomolecules: Properties and functions of Carbohydrates, Nucleic acids, Proteins, Enzymes and Lipids	
Module-2	**5 hrs**
Introduction to applications of biomolecules: Carbohydrates in cellulose-based water filters production, PHA and PLA in bioplastics, Nucleic acids in vaccines and diagnosis, Proteins in food production, Enzymes in biosensors fabrication, Genome & protein data types.	
Module-3	**5 hrs**
Introduction to adaptations of anatomical principles for bioengineering design - Brain as a CPU system. Eye as a Camera system. Heart as a pump system. Lungs as purification system. Kidney as a filtration system.	
Module-4	**5 hrs**
Introduction to nature inspired biomaterials and mechanisms - Echolocation, Photosynthesis, Bird flying, Lotus leaf effect, Shark skin, Kingfisher beak. Artificial blood - haemoglobin-based oxygen carriers (HBOCs).	
Module-5	**5 hrs**

Introduction to trends in bioengineering, Bioprinting techniques and materials. Electrical tongue and electrical nose in food science, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis. Bio-concrete.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Corroborate the concepts of biomimetics for specific requirements.
CO2	Understand the basic biological concepts for relevant industrial applications & adaptations.
CO3	Evaluate the principles of design and development for exploring engineering knowledge in biological stream.
CO4	Explore innovative biobased solutions for socially relevant problems.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	30	-	Average of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Continuous and Comprehensive Evaluation (B)	20	-	Any two Assessment methods as per 24RNBE4.2, scaled to 20 marks.
Total CIE **(A+B)**	50	20	CIE Evaluation is done for a maximum of 50 marks
SEE **(C)**	50	18	Question papers having 50 MCQs with each question carrying 01 mark, and Exam duration shall be for 2 hours.
CIE + SEE **(A+B+C)**	100	40	Final marks shall be the sum of marks scored in Components **A, B and C.**
The minimum marks to be secured in CIE is 20 out of 50 allotted marks to appear for SEE, with minimum 40 % scored in every component of CIE.			

Suggested Learning Resources:

Textbooks

1. Basuchandra's Biology for Engineers, Chandra shekara. B.M, Basavaraju B.C, 2025.
2. Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023.

Reference Books

1. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
2. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W.
3. Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
4. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
5. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
6. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
7. Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
8. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
9. Bioremediation of heavy metals: bacterial participation, by C R Sunil kumar, N Geetha, A C Udaya shankar, Lambert Academic Publishing,

B.E. (Civil Engineering) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Environmental Science Project**		
Course Code	**25BESPR408**	**Scheme**	**2025**
Type of Course	**Societal Development Course (SDC)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(0:0:0) 30 hrs/sem**	**CIE Marks**	**50**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:0:30) 30 hrs/sem**	**SEE Marks**	**50**
Credits	**1**	**Total Marks**	**100**
Examination type (SEE)	**Presentation/Viva Voce**	**Exam Hours**	**3**

Course Objectives:

The purpose of the course is to enable the learner to:

1. Understand environmental awareness, environmental responsibility, and real-world environmental issues including climate change, pollution, biodiversity, resource use, soil erosion, and thermal comfort.
2. Apply field surveys, case studies, data collection, environmental audits, and project documentation for environmental investigations.
3. Analyze environmental problems using technical assessment to identify feasible and sustainable solutions.
4. Design sustainable solutions for environmental problems through individual, multidisciplinary, or community-based project work.

Restrictions and professional conduct:

Environmental Science Projects should be academic, socially responsible, technically focused, and politically neutral. Students and faculty must maintain professionalism, ethical conduct, and respect while working with communities and stakeholders, and avoid any political, ideological, commercial, or disruptive activities. Projects should also consider practical constraints such as cost, resources, safety, environmental impact, and stakeholder cooperation.

SET OF PROJECT ACTIVITIES (TW/SL = 30 HOURS)

Methods for project identification:

Students may identify the project topic using one or more of the following methods:
Interaction with local rural or urban stakeholders such as local leaders, corporation/municipality personnel, NGOs, panchayat representatives, etc.; review of issues highlighted in print and electronic media, and social networks; and, after selecting a broad topic, collect data, conduct a feasibility survey, estimate timelines and resources, approximate expenditure, and define the problem statement and objectives clearly.

List of Project Topics and Engineering Outcomes:

The following structured sequence of activities is to be carried out during the semester:

Sl. No.	Project title	Measurable engineering outcome	Mapped POs	SDGs
1	Rural and urban water conservation and management systems	Prepare a site-specific water-saving plan, estimate water demand–supply gap, and propose a feasible conservation intervention with quantified savings.	PO1, PO2, PO3, PO4, PO10, PO11	SDG 6, SDG 11, SDG 12

2	Waste management and recycling	Conduct waste audit, classify waste streams, and design a segregation/recycling workflow with measurable reduction in mixed waste.	PO2, PO3, PO4, PO6, PO8, PO10	SDG 11, SDG 12, SDG 13
3	Afforestation	Identify a degraded area, prepare plantation layout, and demonstrate survival-rate tracking and maintenance schedule for saplings.	PO2, PO3, PO4, PO6, PO7, PO11	SDG 11, SDG 13, SDG 15
4	Biogas generation and power generation	Estimate organic waste availability, size a small biogas system, and document expected gas output or energy yield.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 7, SDG 11, SDG 12
5	DPR for solar power rural plant	Prepare a DPR with load assessment, panel sizing, cost estimate, and projected energy generation and payback.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 7, SDG 9, SDG 11
6	DPR for electrification of village/tribal community	Map unserved/underserved households, propose electrification layout, and estimate coverage, losses, and implementation cost.	PO1, PO2, PO3, PO4, PO10, PO11	SDG 7, SDG 9, SDG 10
7	DPR for rural drainage system	Survey drainage bottlenecks, develop a drainage layout, and estimate runoff handling capacity and flood-risk reduction.	PO1, PO2, PO3, PO4, PO6, PO10	SDG 6, SDG 9, SDG 11
8	Sustainability and environmental health projects	Assess local environmental health issues and propose interventions with measurable improvement in hygiene, safety, or resource use.	PO2, PO3, PO4, PO6, PO7, PO8	SDG 3, SDG 6, SDG 11, SDG 12
9	Plastic free campaigns	Measure plastic usage before and after awareness intervention and report percentage reduction or behavioral change.	PO2, PO3, PO6, PO7, PO8, PO10	SDG 11, SDG 12, SDG 13
10	Health and nutrition awareness	Conduct baseline and post-program awareness survey and document improvement in awareness score or adoption of healthier practices.	PO2, PO6, PO7, PO8, PO9, PO10	SDG 2, SDG 3, SDG 11
11	Societal projects involving health wellness	Identify a community health need and develop an awareness/service module with measurable participation and feedback outcomes.	PO2, PO3, PO6, PO8, PO9, PO10	SDG 3, SDG 11, SDG 17
12	Air quality monitoring system	Collect air-quality data, compare with reference limits, and present trends along with possible mitigation suggestions.	PO2, PO3, PO4, PO5, PO6, PO10	SDG 3, SDG 11, SDG 13

13	Plastic waste reduction campaign	Track collection, segregation, and replacement actions, and quantify reduction in plastic waste generation or littering.	PO2, PO3, PO6, PO7, PO8, PO10	SDG 11, SDG 12, SDG 13
14	Urban greening projects	Prepare greening plan, identify planting locations, and assess environmental benefits such as shade, aesthetics, or heat mitigation.	PO2, PO3, PO4, PO6, PO7, PO11	SDG 11, SDG 13, SDG 15
15	Smart agriculture solution	Design a low-cost monitoring or irrigation support solution and estimate improvement in water use efficiency or crop support.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 2, SDG 6, SDG 9
16	Smart irrigation system	Estimate crop water requirement, propose control logic, and quantify water savings compared with conventional irrigation.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 2, SDG 6, SDG 12
17	Food security initiatives / Cold storage system	Estimate storage need, design a simple cold-chain concept, and document reduction in spoilage or wastage.	PO1, PO2, PO3, PO4, PO5, PO10	SDG 2, SDG 9, SDG 12

Suggested Learning Resources

Particulars	Titles and Publishers
Textbooks	1. Phadke, N. D., Community Engagement and Social Innovation, Oxford University Press, New Delhi. 2. Garg, N. R., Project-Based Learning in Engineering Education, Pearson India Education Services, Noida. 3. Gupta, A. and P. Singh, Service Learning and Community Projects, McGraw-Hill Education (India), New Delhi. 4. Wilson, G., Practical Guide to Community Development Projects, Routledge, London.
Reference books	1. NPTEL courses on Project-Based Learning and Social Innovation. 2. SWAYAM courses on community engagement and sustainability. 3. UN Sustainable Development Goals portal. 4. MyGov India and local civic body portals for community initiatives. 5. YouTube resources on design thinking, social innovation, and community service learning. 6. NGO and government field-action case studies related to sanitation, water, health, education, and environment.
Web links and Video Lectures (e-Resources)	1. NPTEL courses on Engineering Geology. 2. NPTEL courses on Soil Mechanics and Foundation Engineering. 3. Virtual Labs – Geotechnical Engineering Virtual Lab. 4. Geological Survey of India. 5. YouTube channels on civil engineering experiments. 6. American Society of Civil Engineers (ASCE) – Geotechnical resources and standards.

Teaching Learning Process:
The suggested TLP for Community / Societal Project is as follows;

Week / Phase	Teaching–Learning Activity	Faculty Role	Student Activity	Output / Evidence
1	Course introduction, objectives, ethics, conduct, and assessment briefing	Explain course scope, rules, rubrics, and expected deliverables	Understand course requirements and form teams	Team list, course plan
2	Community problem identification and topic selection	Guide topic framing and feasibility	Identify local issues through discussion and observation	Shortlisted project topic
3	Stakeholder interaction and preliminary survey	Demonstrate survey methods and stakeholder engagement	Collect initial data from community/users	Survey notes, interview record
4	Problem statement and objective formulation	Review and refine problem statement	Prepare problem statement, scope, and objectives	Approved problem statement
5	Literature/case study review and baseline analysis	Suggest relevant references and examples	Study existing solutions and compare approaches	Baseline analysis summary
6	Project planning and role assignment	Help teams organize tasks, timeline, and responsibilities	Plan activities, divide roles, and prepare schedule	Work plan / Gantt chart
7	Feasibility analysis and solution brainstorming	Check technical feasibility and practicality	Generate possible engineering solutions	Solution alternatives sheet
8	Selection of final solution and design approach	Review final concept and design logic	Finalize concept, methods, and expected outcome	Concept note / design outline
9	Data processing / calculations / sizing / mapping	Support computations and technical review	Analyze data, perform calculations, prepare maps/charts	Technical analysis sheet
10	Prototype / model / audit / DPR / app development	Monitor progress and correct technical issues	Develop the selected output	Working model / draft DPR / map / app
11	Testing, refinement, and implementation planning	Evaluate technical correctness and improvements	Test prototype or validate proposal with users	Test results / revised output
12	Field implementation / demonstration / awareness activity	Facilitate community interaction and documentation	Conduct implementation or demonstration	Photos, attendance, implementation record

13	Documentation of outcomes, feedback, and impact	Review report structure and completeness	Compile findings, stakeholder feedback, and observations	Draft report
14	Presentation preparation and viva practice	Conduct mock presentation and feedback	Prepare slides/poster and rehearse	Presentation deck
15	Final presentation, submission, and reflection	Evaluate performance using rubrics	Present project, submit report, reflect on learning	Final report, presentation, viva

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand environmental problems through field interaction, technica assessment, and project planning.
CO2	Apply field survey, data collection, implementation, documentation, and reporting techniques for environmental investigations.
CO3	Analyse environmental problems by considering practical constraints sustainability aspects, collected data, user feedback, and baseline conditions.
CO4	Design sustainable engineering solutions for identified environmenta problems through multidisciplinary project implementation.

Assessment structure:

A. Continuous Internal Evaluation (CIE) – 50 marks

- Students, in batches of 2–4, shall undertake at least one project (or a combination of two related activities) aiming, as far as possible, at a logical implemented or implementable outcome.
- CIE will be conducted by a departmental committee (HoD/nominee, guide and one senior faculty) using the following rubrics totaling 50 marks:

CIE pass requirement:

A student shall secure a minimum of 20 marks out of 50 in CIE to become eligible to appear for SEE.

- Students who fail to earn the required CIE marks may be given additional opportunities before closure of the semester; no re-doing of CIE is permitted after the end of the semester.

B. Semester End Examination (SEE) – 100 marks (scaled to 50)

- Examination duration: 3 hours.
- Maximum examination marks: 100 ***(marks entry in portal to be done for 100 which automatically is reduced to 50)***
- The SEE shall be conducted batch-wise by a committee of two faculty from a different department.

SEE pass requirement and overall passing rule:

- For a pass in SEE, a student shall secure minimum 35 marks out of 100.
- For declaration of a pass grade, the sum of CIE marks (out of 50) and scaled SEE marks (out of 50) shall be ≥ 40; otherwise, the student is awarded grade F (Fail).

CIE Rubric — Continuous Internal Evaluation (Total 50 marks):					
Criterion	**Weight (marks)**	**Excellent (Full marks)**	**Good**	**Fair**	**Needs Improvement**
Problem identification & relevance to society /environment	8	Problem clearly identified with strong evidence of relevance and well-defined scope.	Relevant problem with clear scope and adequate evidence.	Problem defined but justification is weak.	Problem unclear or not relevant.
Formation of problem statement; engineering approach, innovation & feasibility	10	Precise statement; sound, innovative, feasible approach.	Adequate statement; feasible with minor gaps.	Partial statement; marginal feasibility.	Missing or infeasible.
Interaction with stakeholders; data collection, analysis & interpretation	8	Thorough engagement comprehensive data and well interpreted analysis.	Good engagement; adequate data and analysis.	Limited engagement; incomplete data and superficial analysis.	Little or no stakeholder contact; no data/analysis.
Project documentation; clarity, organization & problem-solving demonstrated	10	Complete, well-organized, analytical, and strong problem-solving.	Complete and clear with some analytical content.	Basic with omissions; problem-solving limited.	Missing/poorly organized; no clear problem-solving.

Communication & presentation skills	6	Confident, structured, and answers queries fully; visuals effective.	Clear and satisfactory; responds to most queries.	Acceptable but lacks clarity or confidence; weak responses.	Poor or absent; unable to respond.
Contribution & benefit to society (impact, sustainability)	8	Clear, demonstrable societal benefit and realistic sustainability path.	Benefit plausible; sustainability considered with minor gaps.	Limited or unclear benefit; sustainability weak.	No evident benefit or sustainability.

SEE Rubric — Semester End Examination
(Enter marks out of 100; scaled to 50 later)

Criterion	Weight (marks)	Excellent (Full marks)	Good	Fair	Needs Improvement
Problem identification & relevance to society/ environment	16	Clearly articulated with strong evidence and context.	Clear with reasonable evidence.	Problem stated but evidence/context weak.	Poorly defined or irrelevant.
Formation of problem statement; engineering approach, innovation & feasibility	20	Precise; demonstrates engineering depth, novelty and feasibility.	Technically sound and feasible with minor limitations.	Basic; limited technical depth or feasibility concerns.	No viable engineering approach or infeasible plan.
Interaction with stakeholders; data collection, analysis & interpretation	16	Excellent engagement; rigorous data collection and insightful analysis.	Good engagement and acceptable analysis.	Superficial data collection and limited analysis.	Inadequate or no data; poor analysis.

Project documentation; clarity, technical rigor & problem-solving demonstrated	20	Comprehensive, technically rigorous, and systematic.	Complete and technically correct with minor gaps.	Lacks technical depth or has notable omissions.	Missing key elements or technically incorrect.
Communication, presentation & viva-voce responses	12	Presents expertly, defends work persuasively and answers all queries correctly.	Good presentation and satisfactory answers to most queries.	Adequate but fails to answer some technical questions.	Poor presentation and unable to defend work.
Contribution & benefit to society; impact assessment & sustainability	16	Clear, evidence-based impact assessment with scaling recommendation	Reasonable impact discussion and sustainability consideration	Limited evaluation of impact or sustainability.	No coherent assessment of impact or sustainability.

Suggested Learning Resources:

Text Books:

1. Benny Joseph, Environmental Studies, Tata McGraw-Hill, 2nd Edition.
2. R. Rajagopalan, Environmental Studies: From Crisis to Cure, Oxford University Press, 2005.
3. Erach Bharucha, Textbook of Environmental Studies, University Press, latest edition as available in library.
4. M. P. Poonia and S. C. Sharma, Environmental Studies, Vikas Publishing House, latest edition as available

Reference Books:

1. R. Sivakumar, Principles of Environmental Science and Engineering, Cengage Learning, 2nd Edition.
2. G. Tyler Miller Jr., Environmental Science: Working with the Earth, Thomson Brooks/Cole, 11th Edition.
3. Pratibha Singh, Anoop Singh, and Piyush Malaviya, Text Book of Environmental and Ecology, Acme Learnin 1st Edition.
4. S. M. Prakash, Environmental Studies, Elite Publishing House, Mangalore, 3rd Edition, 2018.

Web links and Video Lectures (e-Resources):

1. VTU e-Learning Centre: http://elearning.vtu.ac.in
2. VTU e-Resources / e-Content: http://elearning.vtu.ac.in/e-Res.php
3. VTU e-Shikshana Lecture Videos: http://elearning.vtu.ac.in/esk3.php
4. VTU Consortium Digital Resources: https://access.vtuconsortium.com/msec
5. VTU e-Learning Centre: http://elearning.vtu.ac.in
6. VTU e-Resources / e-Content: http://elearning.vtu.ac.in/e-Res.php
7. VTU e-Shikshana Lecture Videos: http://elearning.vtu.ac.in/esk3.php
8. VTU Consortium Digital Resources: https://access.vtuconsortium.com/msec

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B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**NSS-National Service Scheme**		
Course Code	**25BNSSP409**	**Scheme**	**2025**
Type of Course	**Non-Credit Mandatory Course (NCMC)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(0:0:0)**	**CIE Marks**	**100**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:0:30)**	**SEE Marks**	**-**
Credits	**-**	**Total Marks**	**100**
Examination type	**-**	**Exam Hours**	**-**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Identify the needs and problems of the community and involve the problem–solving.
2. Develop among them a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
3. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

Module-1
Introduction to NSS, Life Competencies, Youth Leadership and NSS
Module-2
Social connect and responsibilities.
Module-3
Activities -1 (Choose from Activity list)
Module-4
Activities -2 (Choose from Activity list)
Module-5
Activities -3 (Choose from Activity list)

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the motto and concepts of NSS
CO2	Develop overall personality of volunteers and make them as leaders and responsible citizens of our nation
CO3	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
CO4	Communicate effectively with the community and with the officials.

ACTIVITY LIST	
Plantation Drive: Adopt a Tree	Developing & managing an efficient garbage disposal system
Food Preservation/ Packaging awareness	Tourism Promotion: Innovative Approaches
Facilitating 100% digitized money transactions	Contribution to any national-level initiative of the Government of India. E.g. Digital India/ Skill India/ Swachh Bharat Internship etc.,

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
Evaluation based on Reports (A)	100	-	5 modules Reports, 5 modules X 10 M each = 50 M
Total CIE Theory (A)	**100**	**40**	
SEE (B)	**-**	**-**	**-**
CIE+SEE (A+B)	**100**	**40**	**Final marks shall be the sum of marks scored in Components A, B**

- The minimum marks to be secured in CIE is 40 out of allotted 50 marks with minimum 40 % scored in every component of CIE.
- No SEE for this subject

Suggested Learning Resources:

Reference Books:

1) NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2) Government of Karnataka, NSS cell, activities reports and its manual.
3) Government of India, NSS cell, Activities reports and its manual.

Web links:

1) https://nss.gov.in/
2) https://pledge.mygov.in/

B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Physical Education**		
Course Code	**25BPEDU409**	**Scheme**	**2025**
Type of Course	**Non-Credit Mandatory Course (NCMC)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(0:0:0)**	**CIE Marks**	**100**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:0:30)**	**SEE Marks**	**-**
Credits	**-**	**Total Marks**	**100**
Examination type	**-**	**Exam Hours**	**-**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Participate in the competition at regional/state / national / international levels.
4. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

Module-1

Orientation

A. Meaning and Importance of Physical Education
B. Lifestyle
C. Health & Wellness

Module-2

General Fitness & Components of Fitness

A. Meaning and Importance of Fitness
B. Warming up (Free Hand exercises)
C. Strength – Push-up / Pull-ups

Module-3

Specific games (Anyone to be selected by the student)

A. Kabaddi

a) Fundamental skills

Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.

b) Offensive Skills:

Raiding, Hand Touch, Toe Touch, Dubki, Squat Thrust

c) Defensive Skills:

Tackling, Ankle Hold, Thigh Hold, Waist Hold, Blocking, Chain Tackle

d) Other Important Skills:

Agility, Speed, Breath Control, Breath Holding

e) Rules and their interpretation and duties of the officials

B. Kho-Kho

a) Fundamental skills

Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.

b) Skills in Chasing:

Sit on the box (Parallel & Bullet toe method), Get up from the box (Proximal & Distal foot method), Give Kho (Simple, Early, Late & Judgment), Pole Turn, Pole Dive, Tapping, Rectification of foul.

c) Skills in running:

Chain Play, Ring play and Chain & Ring mixed play.

d) Game practice with application of Rules and Regulations.

e) Rules and their interpretations and duties of the officials.

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Physical Education, games and sports skills, Health, Nutrition and Fitness
CO2	Familiarization of health-related Exercises, Sports for overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-----	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Quiz(B)	40	-----	Quiz for a maximum of 40 marks
Total CIE (A+B)	100	40	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Suggested Learning Resources:

Text books

1. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
2. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata.

Reference Books

1. Saraswati Health and Physical Education Textbook
2. V.K. Sharma's Health and Physical Education

RNS
ESTD:2001
An Institute with a Difference

B.E. (Common to All Branches) Outcome Based Education (OBE) and Choice Based Credit System			
Course Title	**Yoga**		
Course Code	**25BYOGA409**	**Scheme**	**2025**
Type of Course	**Non-Credit Mandatory Course (NCMC)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(0:0:0)**	**CIE Marks**	**100**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:0:30)**	**SEE Marks**	**-**
Credits	**-**	**Total Marks**	**100**
Examination type	**-**	**Exam Hours**	**-**

COURSE LEARNING OBJECTIVES:

The purpose of the course is to facilitate the learner to:

1. Physical, Mental & spiritual Objectives of Yoga
2. Explain the meaning of Yoga.
3. Discuss the importance of the Yoga and its scope.
4. Describe the aims and objectives of Yoga.
5. Clarify the misconceptions on Yoga

Module-1

Orientation

a) Introduction of Yoga
b) Aim, and Objectives of Yoga,
c) Yoga, its origin, history and development.

Module-2

Yoga

a) Yoga, its meaning, definitions.
b) Brief introduction of yogic practices for the common man
c) Rules and regulations
d) Misconceptions of Yoga
e) Suryanamaskara

Module-3

Asanas

Types of Asanas:

a) **Sitting-**1. Padmasana, 2. Vajrasana
b) **Standing-**1. Vrikshana, 2. Trikonasana
c) **Prone line-**1. Bhujangasana 2. Shalabh asana
d) **Supine line-** 1. Utthita dvipadasana 2. Ardha halasana

COURSE OUTCOMES:

After successfully completing the course, the student will be able to:

CO1	Understand the fundamental concepts of Yoga
CO2	Improves of health and related aspects, overall growth and development
CO3	Participate in the competition at regional/state/national/international levels.
CO4	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	----	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Quiz(B)	40	----	Quiz for a maximum of 40 marks
Total CIE (A+B)	100	40	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Text books

1. The Yoga Sutras of Patanjali – Sri Swami Satchidananda
2. Light on Yoga — B.K.S Iyengar

Reference Books

1. The Heart of Yoga — T.K.V Desikachar
2. "Asana Pranayama Mudra Bandha" by Swami Satyananda Saraswati

B.E. (Common to All the Branches) Outcome Based Education (OBE) and Choice Based Credit System (CBCS)			
Course Title	**Music**		
Course Code	**25BMUK459**	**Scheme**	**2025**
Type of Course	**Non-Credit Mandatory Course (NCMC)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(0:0:0)**	**CIE Marks**	**100**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(0:0:0:30)**	**SEE Marks**	**-**
Credits	**-**	**Total Marks**	**100**
Examination type	**-**	**Exam Hours**	**-**

Course Learning Objectives:

The purpose of the course is to facilitate the learner to:

1. Understand the origin, evolution, and fundamental concepts of Indian classical music.
2. Familiarize themselves with the basic forms of **Carnatic and Hindustani music compositions** and appreciate their musical structure and significance.
3. Identify and classify the major musical instruments used in **Carnatic and Hindustani music** and understand their construction and performance characteristics.
4. Recognize the contributions of eminent Indian composers and musicians to the development and preservation of Indian classical music.
5. Develop an appreciation for India's rich musical heritage, fostering creativity, cultural awareness, and lifelong interest in music.

Module-1	**3 hrs**
Origin of the Indian Music: Evolution of the Indian music system, Understanding of Shruthi, Nada, Swara, Laya, Raga Tala, Mela.	
Module-2	**3 hrs**
Compositions: Introduction to the few types of composition in Carnatic Music- Geethe, Swarajathi, Varna, Madhyama Kala Krithi,	
Module-3	**3 hrs**
Compositions: Introduction to the few types of composition in Hindustani Music : Khayal, Drupad, Tarana	
Module-4	**3 hrs**
Music Instruments: Classification and construction of string instruments, percussion instruments in both Carnatic and Hindustani Music.	
Module-5	**3 hrs**
Composers: Biography and contributions of the following eminent personalities Purandaradasa, Thyagaraja, Pt. Mallikarjun Mansur, Vidhushi Gangubhai Hangal	

Course Outcomes:

After successfully completing the course, the student will be able to:

CO1	Explain the origin, evolution, and fundamental concepts of Indian classical music. *(Bloom's Level: Understand – L2)*
CO2	Compare and distinguish the characteristics of selected Carnatic and Hindustani music compositions. *(Bloom's Level: Analyze – L4)*
CO3	Classify the major categories of Indian musical instruments and describe their construction and applications in Carnatic and Hindustani music. *(Bloom's Level: Analyze – L4)*
CO4	Examine the contributions of eminent Composers/Musicians and appreciate their role in preserving and promoting Indian classical music. *(Bloom's Level: Evaluate – L5)*

ASSESSMENT DETAILS (CIE and SEE):

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-	Sum of Two Internal Assessment Tests (MCQs) each conducted for 30 marks.
Experimental Work(B)	40	-	Submission of report on a topic related to music.
CIE + SEE (A+B)	**100**	**40**	CIE Evaluation is done for a maximum of 100 marks
• The minimum marks to be secured in CIE is 40 (40%) out of 100 marks allotted to Pass.			

Text Books:

1	Vidushi Vasantha Madhavi, "Theory of Music", Prism Publication, 2007.
2	T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana- Vol. 1 (English), Shreenivaas Prakaashana, 2018.
3	B. Chaitanya Deva, An Introduction to Indian Music, Publications Division, Government of India, New Delhi.

Reference Books:

1	Lakshminarayana Subramaniam, Viji Subramanaim, "Classical Music of India: A Practical Guige, Tranqueber 2018.
2	R. Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019,
3	Vamanrao H. Deshpande, Indian Musical Traditions: An Aesthetic Study of the Gharanas in Hindustani Music, Popular Prakashan, Mumbai.

B. E. (Common to All Branches)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

ADDITIONAL MATHEMATICS – II
(Mandatory Learning Course: Common to All Branches)
(A Bridge course for Lateral Entry students under Diploma quota to BE/B. Tech.)

Course Code	**25BMADP410**	**Scheme**	**2025**
Type of Course	**Non-Credit Mandatory Course (NCMC)**	**Semester**	**IV**
Teaching Hours/Week (L:T:P)	**(14:0:0)**	**CIE Marks**	**100**
Total Hours of Pedagogy per semester (L:T:P: TW& SL)	**(14:0:0:14)**	**SEE Marks**	**-**
Credits	**PP**	**Total Marks**	**100**
Examination type	**-**	**Exam Hours**	**-**

COURSE LEARNING OBJECTIVES: *The purpose of the course is to facilitate the learner to:*

1. Apply the essential concepts of linear algebra to solve systems of linear equations and analyze mathematical models.
2. Solve second- and higher-order ordinary differential equations using appropriate analytical methods in engineering contexts.
3. Develop the knowledge and problem-solving skills required to evaluate multiple integrals, apply change of order of integration.
4. Apply numerical methods to obtain approximate solutions to mathematical problems arising in science and engineering.

Module-1

Linear Algebra: Introduction - rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations - Gauss elimination method. Eigen values and Eigen vectors of a square matrix. Problems.

Module-2

Numerical Methods: Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae (Statements only)-problems. Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods (only formulae)-Illustrative examples. Numerical integration: Simpson's one third rule (without proof) Problems.

Module-3

Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. *[Particular Integral restricted to* $R(x)=e^{ax}$, $\sin ax$ /$\cos ax$ *for* $f(D)y = R(x)$.]

Module-4

Double integrals: Definition, evaluation of rectangular and general regions, Change of order of integration.

Module-5

Triple integrals: Definition and evaluation over simple regions, Applications of triple integrals to the evaluation of volumes.

Course Outcomes:

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

CO1: Solve systems of linear equations using matrix algebra.

CO2: Apply the knowledge of numerical methods in modelling and solving engineering

problems.
CO3: Apply analytical methods to solve higher order differential equations.
CO4: Solve double integrals, including change of order of integration,
CO5: Solve triple integrals, volumes of geometrical regions.

ASSESSMENT DETAILS (Both CIE and SEE)

Assessment Type	Maximum Marks	Minimum Passing Marks	Evaluation Details
CIE – IA Tests (A)	60	-	Two tests of each of 50 marks shall be conducted. Average of Two Internal Assessment Tests shall be scaled down to 60 marks.
Continuous and Comprehensive Evaluation (B)	40	-	Any two Assessment methods of each of 20 marks as per 24RNBE4.2 (*if it is project based, one assignment shall be given), scaled to 40 marks.
Total CIE (A+B)	**100**	**40**	**CIE Evaluation is done for a maximum of 50 marks**
SEE (C)	-	-	No SEE for this subject
CIE + SEE (A+B+C)	**100**	**40**	Final marks shall be the sum of marks scored in Components **A, B and C.**

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				
1	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	43rd Edition, 2015
Reference Books				
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition, 2015
2	Engineering Mathematics	N. P. Bali and Manish Goyal	Laxmi Publishers	7th Edition, 2007
3	Engineering Mathematics Vol. I	Rohit Khurana	Cengage Learning	1st Edition, 2015