BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

Avalahalli, Yelahanka, Bengaluru 560064

Bachelor of Engineering

Department of Civil Engineering

VII Semester Scheme and Syllabus
2021 Scheme - Autonomous

Approved in the BoS meeting held on 12/07/2024

Program Educational Objectives (PEOs)

- Lead a successful career by analyzing, designing and solving various problems in the field of Civil Engineering.
- Execute projects through team building, communication and professionalism.
- Excel through higher education and research for endured learning.
- Provide effective solution for sustainable environmental development.

Vision and Mission of the Department

Vision

To be an Exemplary Centre, disseminating quality education and developing technically competent civil engineers with professional integrity for the betterment of society.

Mission

- Impart technical proficiency through quality education.
- Motivate entrepreneurship through enhanced industry - interaction and skill-based training.
- Inculcate human values through outreach activities.

Program Specific Outcomes (PSOs)

- Identify & address the challenges in transportation, sanitation, waste management, and urban flooding in metropolitan cities.
- Provide solutions related to civil engineering built environment through a multidisciplinary approach.

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BMS Institute of Technology and Management
(An Autonomous Institution, Affiliated to VTU Belagavi)
Avalahalli, Doddaballapur Main Road, Bengaluru, Karnataka – 560064

Ref.: BMSIT&M/Exam/2023-24/ 103 **Date:** 21.09.2024

CONTINUOUS INTERNAL EVALUATION
AND
SEMESTER END EXAMINATION PATTERN
(Applicable to UG students of 2021 Batch, effective from the Academic year 2024-25 onwards)

The UG students admitted during 2021-22 are hereby informed to note the following with reference to Continuous Internal Evaluation and Semester End Examination pattern:

The weightage for Continuous Internal Evaluation (CIE) is 50%, and for Semester End Examinations (SEE), it is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 out of 50), while for the SEE, the minimum passing mark is 35% of the maximum marks (18 out of 50). A student will be declared to have passed the course if they secure at least 40% (40 out of 100) in the combined total of the CIE and SEE.

The details below summarize the CIE and SEE Pattern for the courses of 2021 scheme of various credits:

4 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- **Internal Assessment (IA) Tests:** 2 IAs to be conducted for **40 Marks** (90 minutes each). Total of 2 tests will be 80 and the same can be scale down to **30 Marks.**
- **Alternate Assessment Tool (AAT):** 2 AATs each of **10 Marks**, total **20 Marks.** Any Two AATs can be used from the list. If it is project based, one AAT shall be given.
- **Total CIE Marks** = 30 + 20 = **50 Marks**
- Student has to score a minimum of **20 Marks** (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

- SEE is conducted for 100 Marks (3 hours).
- **Question Paper Pattern:**
  - **Part - A:** Comprises 20 objective type questions carrying 1 Mark each with a total 20 Marks.
  - **Part - B:** There will be **5 modules**. Each module will have **TWO questions carrying 16 marks** each. There will be a maximum of three sub section for each question. **Student has to answer any ONE full question.**

- **SEE Marks = 20 + 80 = 100 marks and can be scale down to 50 marks.**

3 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- **Internal Assessment (IA) Tests:** 2 IAs to be conducted for **40 Marks** (90 minutes each). Total of 2 tests will be 80 and the same can be scale down to **30 Marks.**
- **Alternate Assessment Tool (AAT):** 2 AATs each of **10 Marks**, total **20 Marks.** Any Two AATs can be used from the list. If it is project based, one AAT shall be given.
- **Total CIE Marks** = 30 + 20 = **50 Marks**
- Student has to score a minimum of **20 Marks** (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

- SEE is conducted for 100 Marks (3 hours).
- **Question Paper Pattern:**
  - **Part - A:** Comprises 20 objective type questions carrying 1 Mark each with a total 20 Marks.
  - **Part - B:** There will be **5 modules**. Each module will have **TWO questions carrying 16 marks** each. There will be a maximum of three sub section for each question. **Student has to answer any ONE full question.**

- **SEE Marks = 20 + 80 = 100 marks and can be scale down to 50 marks.**

2 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 2 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 2 tests will be 80 and the same can be scale down to **30 marks.**
- **Alternate Assessment Tool (AAT):** 2 AATs each of 10 marks, total **20 marks.** Any Two AATs can be used from the list. If it is project based, one AAT shall be given.
- **Total CIE Marks** = 30 + 20 = **50 Marks**
- Student has to score a minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks (2 hours).

Question Paper Pattern:

- The pattern of the question paper is MCQ.
- SEE question paper will be set for 100 questions each of 01 marks. The same is scale down to 50 marks. Minimum SEE Marks: 40% (i.e. 20 Marks out of 50)

1 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- **Internal Assessment (IA) Tests:** 2 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 2 tests will be 80 and the same can be scale down to **30 marks.**
- **Alternate Assessment Tool (AAT):** 2 AATs each of 10 marks, total **20 marks.** Any Two AATs can be used from the list. If it is project based, one AAT shall be given.
- **Total CIE marks** = 30 + 20 = **50 Marks**
- Student has to score a minimum of **20 Marks** (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

- SEE is conducted for **50 Marks** (1 hours).
- **Question Paper Pattern:**
  - The pattern of the question paper is MCQ.
  - SEE question paper will be set for 50 questions each of 01marks. The same is scale down to **50 Marks**.

1 CREDIT LABORATORY COURSE / PROFESSIONAL CORE LABORATORY / ABILITY ENHANCEMENT COURSE

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- **Cumulative Assessment (CA)** of each experiment is 20 Marks (Conduction 10 marks + Records 5 marks +Viva 5marks). The average of all the experiments to be taken for **20 Marks.**
- **Open Ended Experiments (OE) 10 Marks.**
- **2 IAs Test** to be conducted for 100 marks. General rubrics suggested for SEE are: Writeup 20 marks, Conduction of the experiments, calculations, graphs, results, etc.: 60 marks and Viva: 20 marks. The average of 2 IA marks is scale down to **20 Marks**.
- **CIE marks** =20 (CA) +10 (OE) + 20 (IA test) = **50 Marks**.
- Student has to score a minimum of **20 Marks** (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

- SEE is conducted for 100 Marks.
- Examinations to be conducted jointly by Two examiners.
- All the experiments are to be included for practical examination.
- General rubrics suggested for SEE are: Writeup 20 marks, Conduction of the experiments, calculations, graphs, results, etc.,: 60 marks and Viva: 20 marks.

Learning Activities for AATs:

A faculty member may choose the following AATs based on the needs of the course:

1. Course project
2. Literature review
3. MOOC
4. Case studies
5. Tool exploration
6. GATE-based aptitude test
7. Open book tests
8. Industry integrated learning
9. Analysis of Industry / Technical / Business reports
10. Programming assignments with higher Bloom level
11. Group discussions
12. Industrial / Social / Rural projects

CoE 21/09/2024

Dean AA 21.09.24

Principal 21/9/2024

Copy To:

1. The Vice-Principal, Deans, HoDs, and Associate HoDs
2. All faculty members and students of 2021 batch.
3. Examination Section

Scheme of VII Semester

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute affiliated to VTU)

Scheme of Teaching and Examination: Effective from AY 2021– 22

Choice Based Credit System (CBCS)

UG PROGRAM: CIVIL ENGINEERING (CV) — **Semester: VII**

Sl. No.	Course Category	Course Code	Course Title	Teaching Dept.	Teaching Hours /Week				Credits	Examination			
					L	T	P	PW		Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	HS	21HSS71	Research Methodology	CV	2	0	0	0	2	2	50	50	100
2	AEC	21CV72	Finishing School for Civil Engineering	CV	0	0	2	0	1	2	50	50	100
3	PE	21CV73X	Professional Elective III	CV	3	0	0	0	3	3	50	50	100
4	PE	21CV74X	Professional Elective IV	CV	3	0	0	0	3	3	50	50	100
5	OE	21CV75X	Open Elective II	CV	3	0	0	0	3	3	50	50	100
6	PW	21CVP76	Project Work Phase I	CV	0	0	0	10	5	-	100	-	100
TOTAL					**11**	**0**	**2**	**10**	**17**		**350**	**250**	**600**

Professional Elective - Group III	
Course Code	**Course Title**
21CV731	Advanced Design of RCC and Steel Structures
21CV732	Repair, Retrofitting and Rehabilitation of Structures
21CV733	Advanced Geotechnical Engineering
21CV734	Design of Hydraulic Structures
21CV735	Industrial Waste Water Treatment

Professional Elective - Group IV	
Course Code	**Course Title**
21CV741	Design of Pre-stressed Concrete Structures
21CV742	Prefabricated Structures
21CV743	Design Concept in Building Services
21CV744	Ground Water Hydraulics
21CV745	Environmental Impact and Risk Assessment

Open Elective (OE) - Group II	
Course Code	**Course Title**
21CV751	Environmental Protection and Management
21CV752	Green Buildings
21CV753	Conservation of Natural Resources
21CV754	Intelligent Transportation Systems
21CV755	Sustainable Development Goals

VII Semester Syllabus

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Research Methodology (2:0:0) 2

(Effective from the academic year 2024-25)

Course Code	21HSS71	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:0:0	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	2 Hours

Course objectives:

This course will enable students to:

1. Give an overview of the research methodology, research problem.
2. Gain knowledge on research design.
3. Design of sampling survey and measurement & scaling.
4. Understand data collection and data preparation.
5. Familiarize interpretation and writing research reports.

Module – 1

Introduction: Importance of Research and Development (R&D) for development of Nation, Introduction to research and research methodology.

Meaning of Research, objectives of Research, Types of research, Research Approaches, Significances of Research, Research Process, Criteria of Good Research.

Defining the Research Problem: What is a Research Problem? Selecting the Research Problem, Necessity of Defining the Problem, Techniques Involved in Defining a problem.

Module – 2

Research Design: Meaning of Research Design, need for Research design, Feature of a Good design, Important concepts relating to Research Design: Dependent, independent and extraneous variable, Control, Confounded relationship. Research Design in case of exploratory research studies, in case of descriptive and diagnostic research studies Basic Principles of Experimental Designs.

Module – 3

Design of sampling survey: Sample Design: Objective, sampling units and frame, size of sample, parameter of interest, selection of proper sample design, pilot survey and budgetary constraints. Sampling errors, non-sampling errors, Sample survey vs. census survey, on-probability samplings.

Measurement and scaling: Quantitative and qualitative data, Classification of measurement scales. Goodness of measurement scales: Techniques of developing measurement tools, scaling, Scale classification bases, scaling techniques.

Module – 4

Data Collection: Experiments and Surveys, collection of primary data: observation method, Interview method. Collection of data through questionnaires, Collection of data through schedules. Collection of secondary data. Selection of appropriate method for data collection, case study method.

Data Preparation: Questionnaire checking, editing, coding, tabulation, data cleaning, data adjusting, problems in preparation process, missing values and outliers, type of analysis.

Module – 5

Interpretation and Report Writing

Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of Research Report, Types of Reports: Technical report, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research.

Course outcomes:

The students will be able to:

CO 1. Acquire some basic concepts of research and its methodologies.
CO 2. Describe the different types of research design methods.
CO 3. Explain the various sampling, measurement, and scaling techniques.
CO 4. Analyse the ethical practices in conducting research and dissemination of results in different forms using data collection and data preparation methods.
CO 5. Apply various techniques to interpret research reports.

Text Book:

1. CR Kothari and Gaurav Garg, Research Methodology, New Age International Publishers, 2020.

References:

1. Panneerselvam R, Research Methodology, Prentice Hall of India, New Delhi, 2004.
2. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U K, An introduction to Research Methodology, RBSA Publishers, 2002**.**
3. Ranjit Kumar, Research Methodology, 4th Edition, SAGE Publications Ltd. 2014.

ASSESSMENT METHODS:

CIE Components (50 Marks)

• There will be 2 IA Tests which are descriptive.
• The Pattern of SEE will be as follows:
Part A: 20MCQ with 1 mark each
Part B: Descriptive QP for 80 marks
• There will be one AAT for 20 marks. AAT is a paper publication in an indexed Journal/Conference.
• The Chief Course Coordinator is required to conduct a meeting with all the course coordinators to finalize the syllabus to be covered for IA, CIE & SEE QP's setters. Also, the rubrics to be designed for the evaluation of AAT.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Finishing School for Civil Engineering (0:0:1) 1

(Effective from the academic year 2024-25)

Course Code	21CV72	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	30	Exam Hours	2 Hours

Course objectives:

This course will enable students to:

1. Comprehend fundamentals of building design.
2. Emphasis on suitable structural scheme and integrated design concepts.
3. Impart knowledge on construction and management in building construction.
4. Training on software and applications for designing RCC & Steel structures.
5. Cognizance in 3-Dimensional modeling, Analysis & Design.

SL NO	Experiments
1	Preparation of a Suitable Building Plan [Framed Structure] as per the Client Requisites and Approval Style Drawing following the By Laws.
2	Building materials, paints and maintenance basics- selection for structural and finishing works.
3	Structural Analysis and Design of the Building by Using Software Computation and Manual Calculations.
4	Marking of Site Boundary and Column Layout on the Levelled Site through Conventional or Advanced Survey Equipment.
5	Preparation of Detailed Estimate and Abstract following the latest Schedule of Rates and also, preparation of Bar Bending Schedule.
6	Preparation of Structural and Working Drawings. Drafting and Detailing.
7	Analyze the project, and decide appropriate formwork materials and suitable formwork system. Design formwork systems as per Industrial requirement.
8	Construction Project Management with Schedule using Software. Quantification and Quality Assurance

Course outcomes:

The students will be able to:

CO 1. Apply the acquired Engineering Knowledge to Plan and Execute Construction of Building as an individual and team.

CO 2. Perform Analysis per the code specifications and prepare the report comprehensively to communicate efficiently

CO 3. Record the observations and Draft the Detailing of Drawings as per requirements

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Advanced Design of RCC and Steel Structures (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV731	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Provide basic knowledge in the areas of limit state method and concept of design of RC and Steel structures
2. Identify, formulate and solve engineering problems in RC and Steel Structures
3. Give procedural knowledge to design a system, component or process as per needs and specifications of RC Structures like Retaining wall, Footing, Water tanks, Portal Frames and Steel Structures like Roof Truss, Plate Girder and Gantry Girder.
4. Imbibe the culture of professional and ethical responsibilities by following codal provisions in the analysis, design of RC and Steel Structures.
5. Provide factual knowledge on analysis and design of RC Structural elements, who can participate and succeed in competitive examinations.

Module – 1

Footings: Design of rectangular slab, slab-beam type combined footing.

Retaining Walls: Design of cantilever Retaining wall. Design concept of counter fort retaining wall.

Water Tanks: Design of circular water tanks resting on ground (Rigid and Flexible base). Design of rectangular water tanks resting on ground. As per IS: 3370 (Part IV).

Portal frames: Design of portal frames with fixed and hinged based supports.

Module – 2

Roof Truss: Design of roof truss for different cases of loading, forces in members to given. (Bolted Connection only)

Plate Girder: Design of welded plate girder with intermediate stiffener, bearing stiffener and necessary checks

Course outcomes:

The students will be able to:

Apply the appropriate Engineering Knowledge acquired to Analyse and Design

CO 1: Apply the appropriate Engineering Knowledge acquired to Analyse and Design R.C.C. and Steel Structures.

CO 2: Analyse and evaluate the structural detailing of R.C.C. and Steel Structures in commitment to the ethical norms as per standards.

Semester End Examination:
Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the
subject (**duration 03 hours)**
1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3
sub-questions), **should have a mix of topics** under that module.
The students have to answer 5 full questions, selecting one full question from each module.

Text Books
1. N Krishna Raju, **"Structural Design and Drawing of Reinforced Concrete and Steel : 3rd Edition"**, University Press,2009
2. Subramanian N, **"Design of Steel Structures – Limit State Method "**, Oxford university Press, New Delhi, 2019.
3. K S Duggal, **"Design of Steel Structures",**2nd Edition, Tata McGraw Hill, New Delhi,2017.
Reference Books:
1. Charles E Salman, Johnson & Mathas, **"Steel Structure Design and Behavior"**, Pearson Publications,2009.
2. N.S. Trahair, M.A. Bradford, David Nethercot, Leroy Gardner **"Behavior and Design of Steel Structures to EC 3"**, CRC Press,2007.
3. P C Verghese, **"Limit State Design of Reinforced Concrete",2nd Edition**, PHI Publications, New Delhi,2008.
4. S N Sinha, **"Reinforced Concrete Design"**, 3rd Edition,McGraw Hill Publication,2017.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Repair, Retrofitting and Rehabilitation of Structures (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV732	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Investigate the cause of deterioration of concrete structures.
2. Strategies different repair and rehabilitation of structures.
3. Evaluate the performance of the materials for repair

Module – 1

General: Introduction and Definition for Repair, Retrofitting, Strengthening and rehabilitation. Physical and Chemical Causes of deterioration of concrete structures, Evaluation of structural damages to the concrete structural elements due to earthquake.

Module – 2

Damage Assessment: Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive and semi destructive testing systems

Module – 3

Influence on Serviceability and Durability: Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and cathodic protection.

Module – 4

Maintenance and Retrofitting Techniques: Definitions: Maintenance, Facts of Maintenance and importance of Maintenance Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, Externally bonding(ERB) technique, near surface mounted (NSM) technique, External post-tensioning, Section enlargement and guidelines for seismic rehabilitation of existing building.

Module – 5

Materials for Repair and Retrofitting: Artificial fiber reinforced polymer like CFRP, GFRP, AFRP and natural fiber like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning.

Course outcomes:

The students will be able to:

CO 1: Detect the causes for structural concrete and structures deterioration and evaluate the damages.

CO 2: Assess the type and extent of damage and carry out the assessment of structures through various types of tests

CO 3: Recommend maintenance requirements of the buildings and preventive measures against influencing factors on Serviceability and Durability of the Structures

CO 4: Identify the causes for the damage in structures and recommend most appropriate repair and retrofitting strategies, and also their rehabilitation.

CO 5: Select suitable material and suggest an appropriate technique for repair and retrofitting.

Text Books

1. Sidney, M. Johnson, "Deterioration, Maintenance and Repair of Structures",1980.

2. Denison Campbell, Allen & Harold Roper, "Concrete Structures – Materials, Maintenance and Repair"-Longman Scientific and Technical,1991.

Reference Books:

1. R.T.Allen and S.C. Edwards, "Repair of Concrete Structures"-Blakie and Sons,2019.

2. Raiker R.N., "Learning for failure from Deficiencies in Design, Construction and Service"- R&D Center (SDCPL),1987.

3. CPWD Manual

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Advanced Geotechnical Engineering (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV733	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Gain knowledge of about advanced topics of foundation design and analyses, supplementing their comprehensive knowledge acquired in basic foundation engineering course.
2. Develop profound understanding of shallow and deep foundation analyses.
3. Develop understanding of choice of foundation design parameters.
4. Learn about cause and effect of dynamic loads on foundation.

Module – 1

Shallow Foundations: Geotechnical design of Isolated, Combined, Strip, Strap and Raft Foundation Factors influencing the selection of foundation bearing capacity & settlements of raft foundation, Coefficient of subgrade reaction, Beams on elastic foundation

Module – 2

Pile Foundations: Necessity of pile foundations, Classification, Load bearing capacity of single pile by Static formula, Dynamic formula, Pile load test and Penetration tests. Pile groups, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, laterally loaded piles and under reamed piles.

Module – 3

Environmental Geotechnical Engineering: Relevance, Subsurface Contamination and Contaminant Transport; Waste disposal on Land and Containment, Monitoring of subsurface contamination, Control and Remediation. Engineering Properties of waste and geotechnical reuse, erosion control, sustainability, energy geotechnics Geotechnical aspects of landfills

Module – 4

Transportation Geotechnics: Geotechnics of pavements, railway tracks and airfields, Geomaterial including nontraditional materials, Asphalt mixtures and hydraulically-bound materials Earthworks for transportation facilities, Construction and maintenance, Performance evaluation and quality control

Module – 5

Earthquake Geotechnical Engineering: Effect of earthquake on ground, Primary and Secondary effects of earthquake to geotechnical structures, Liquefaction – Mechanism, Consequence, Factors influencing and mitigation against Liquefaction, Site effects, Wave propagation in soils, Case studies of earthquake damage to geotechnical facilities.

Course outcomes:

The students will be able to:

CO 1: Design shallow foundations, considering bearing capacity, settlement, and subgrade reaction for various foundation types.

CO 2: Analyze pile foundations, including load capacity, group behavior, settlement, and lateral loads.

CO 3: Assess subsurface contamination, waste disposal, and sustainable geotechnical solutions for environmental protection.

CO 4: Evaluate geotechnical aspects of transportation infrastructure, focusing on material selection, construction, and performance.

CO 5: Understand earthquake effects on geotechnical structures, liquefaction, and mitigation measures through case studies.

Text Books

1. Punmia B.C., "Soil Mechanics and Foundation Engineering, Laxmi Publications Co., India,2017
2. Murthy V.N.S., "Geotechnical Engineering: Principles and Practices of Soil Mechanics and FoundationEngineering", CRC Press, New York,2010.
3. Kramer., "Geotechnical Earthquake Engineering", 1st edition, Pearson Education India;,2003

Reference Books:

1. Bowles J.E., "Foundation Analysis and Design", McGraw Hill Pub. Co. New York,1982.
2. Swami Saran, "Analysis and Design of Substructures", Oxford & IBH Pub. Co. Pvt. Ltd., India,2018.
3. R.B. Peck, W.E. Hanson & T.H. Thornburn, "Foundation Engineering", Wiley Eastern Ltd., India.
4. Braja, M. Das, "Principles of Geotechnical Engineering", Cengage Learning, India,2015.
5. Bureau of Indian Standards: IS-1904, IS-6403, IS-8009, IS-2950, IS-2911 and all other relevant Codes.
6. Dingqing Li, james Hyslip, Ted Sussmann and Steven Chrismer "Railway Geotechnics",1st Edition CRC Press; ,2019.
7. Ikuo Towhata., "Geotechnical Earthquake Engineering" Springer; 2008.
8. Sarsby, R., Environmental Geotechnics, Thomas Telford, 2000.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Design of Hydraulic Structures (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV734	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Analyse and design gravity dam
2. Design earth dam and estimate the seepage loss
3. Design spillway and apron for diversion works
4. Design CD works and can regulation works

Module – 1

Gravity Dam: Introduction, forces acting on dam section, causes of failure, design principles, Principal and Shear stresses, Elementary and practical profile of gravity dam, Drainage gallaries.

Module – 2

Earth Dam: Introduction, Causes of failure, Design criteria, Preliminary section, Determination of phreatic line, Estimation of seepage loss.

Module – 3

Spillway: Types, Design of Ogee spillway, Upstream and Downstream profile, Energy dissipation below spillway. Diversion Headwork: Design of weir on permeable soil, Design of impervious foundation using Bligh's and Khosla's theory, Simple problems on floor/apron design.

Module – 4

Cross Drainage Works: Introduction, Types of cross drainage works, Design considerations, Transition formula, Design of syphon Aqueduct.

Module – 5

Canal Regulation Works: Introduction, Functions of Head and Cross regulations, Longitudinal section and their component parts, Design of canal regulators. IS:6531 (1972) – Criteria for design of canal head regulator, bIS:7114(1973) – Criteria for hydraulic design of cross regulator for canals

Course outcomes:

The students will be able to:

CO 1: Design the gravity dam section for various force profiles considering design principles.

CO 2: Analyze seepage in an earth dam considering the design criteria.

CO 3: Design ogee spillway profile and floor of weir on permeable foundation.

CO 4: Design an aqueduct considering the canal transitions.

CO 5: Design canal regulators considering hydraulic design criteria

Text Books

1. S. K. Garg, "Irrigation Engineering and Hydraulic Structures",38th Edition, Khanna Publishers, New Delhi Jayarami,1976
2. P. Jaya Rami Reddy, "A Text Book of Hydrology",3rd Edition, Lakshmi Publications, New Delhi,2016
3 B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jainl, Pande Brij Basi Lal, "Irrigation and Water Power Engineering",17th Lakshmi Publications, New Delhi,2021

Reference Books:

1. Sharma R.K., "Text Book of Irrigation Engineering and Hydraulics", Oxford & IBH Publishing Co., New Delhi.
2. Modi P.N., "Irrigation, Water Resources and Water Power Engineering"- Standard book house, Delhi.
3. K. R. Arora, " Irrigation, Water Power and Water Resources Engineering", Standard Publishers, New Delhi,2010

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Industrial Waste Water Treatment (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CVC735	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. To provide knowledge on sources and characteristics of Industrial Wastewaters, Techniques and approaches for minimizing the generation of wastewaters at the source and application of physico-chemical, biological and advanced treatment methods for recovery, reuse and disposal of wastewaters in Indian Industries.

Module – 1

INDUSTRIALPOLLUTION PREVENTION - Industrial scenario in India – Uses of water by Industry – sources, generation rates and characteristics of Industrial wastewaters – Toxicity of Industrial Effluents and Bioassay Tests – Environmental Impacts of Industrial Wastewaters – Regulatory requirements for Industrial wastewaters- Prevention Vs Control of Industrial Pollution – Benefits and Barriers – Waste Minimization Strategies – Evaluation of Pollution Prevention Options – Cost benefit analysis – Pay back period.

Module – 2

INDUSTRIALWASTEWATER TREATMENT Physico–Chemical Treatment Processes – Equalisation, Neutralisation, Oil Seperation, Flotation – Precipitation, Aerobic and Anaerobic Biological Treatment Processes – Sequencing batch reactors, membrane bioreactors, Advanced oxidation and Tertiary Treatment processes for removal of dissolved organics and inorganics- Ozonation, photocatalysis, Evaporation and membrane Technologies

Module – 3

ZERO LIQUID DISCHARGE Individual and Common Effluent Treatment Plants –Zero Effluent Discharge Systems and Management of RO Rejects, Quality requirements for wastewater reuse – Industrial reuse, Disposal on water and land.

Module – 4

SLUDGE AND HAZARDOUS WASTE MANAGEMENT - Residuals of Industrial Wastewater treatment – Quantification and Characteristics of Sludge – Thickening, Digestion, Conditioning, Dewatering and Disposal of Sludge – Solidification – Incineration – Secured Landfills-Hazardous waste management.

Module – 5

CASE STUDIES - Industrial manufacturing process description, Wastewater characteristics, Pollution Prevention Options and Treatment Flow sheets for selected Industries – Tanneries- Textiles- Pulp and PaperMetal finishing – Sugar and Distilleries.

Course outcomes:

The students will be able to:

CO 1: Explain the source and types of industrial wastewater and their environmental impacts and choose the regulatory laws pertaining to environmental protection.

CO 2: Apply knowledge and skills to design industrial wastewater treatment schemes.

CO 3: Design facilities for the processing and reclamation of industrial wastewater.

CO 4: Plan and develop sludge management scheme for sludge generated from industries.

CO 5: Conduct research to develop effective management systems for industrial wastewater that are technically sound, economically feasible and socially acceptable.

Text Books

1. S.C.Bhatia, Handbook of Industrial Pollution and Control, Volume I & II, CBS Publishers, New Delhi, 2003.

2. Mahajan, S.P.Pollution Control in Process Industries, Tata McGraw Hill Publishing Co., New Delhi, 2017.

Reference Books:

1. Eckenfelder, W.W., "Industrial Water Pollution Control",Mc-Graw Hill, 2000.

2. Nelson Leonard Nemerow, "Industrial waste treatment – contemporary practice and vision for the future", Elsevier, Singapore, 2007.

3. Frank Woodard, „ Industrial waste treatment Handbook" , Butterworth Heinemann, NewDelhi,2001.

4. World Bank Group, „ Pollution Prevention and Abatement Handbook – Towards Cleaner Production" , World Bank and UNEP, Washington D.C., 1998

5. Paul L. Bishop, „ Pollution Prevention:- Fundamentals and Practice" , Mc-Graw Hill International, Boston,2000.

6. Wang L.K., Yung-Tse Hung, Howard H.Lo and Constantine Yapijakis, „Handbook of Industrial and Hazardous Wastes Treatment" , Marcel Dekker, Inc., USA, 2004.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Design of Pre-stressed Concrete Structures (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV741	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. To understand Concepts of pre stressing
2. To understand Materials used in Pre stressed concrete technology
3. To analyse and design Pre stressed concrete structural elements

Module – 1

Introduction and Analysis of Members: Concept of Pre stressing - Types of Pre stressing - Advantages - Limitations –Pre stressing systems - Anchoring devices - Materials – Mechanical Properties of high strength concrete - high strength steel - Stress-Strain curve for High strength concrete. Comparison between RCC & PSC. Analysis of members at transfer - Stress concept - Force concept - Load balancing concept – Kern point -Pressure line. (More problems on stress concept)

Module – 2

Losses in Pre stress: Loss of Pre stress due to Elastic shortening, Friction, Anchorage slip, Creep of concrete, Shrinkage of concrete and Relaxation of steel - Total Loss.

Deflection: Deflection due to gravity loads - Deflection due to prestressing force -Total deflection - Limits of deflection - Limits of span-to-effective depth ratio.

Module – 3

Design of Sections for Flexure: Analysis of members at ultimate strength - Preliminary Design - Final Design for simply supported beams.

Module – 4

Design for Shear: Analysis for shear - Components of shear resistance - Modes of Failure – Limit State of collapse for shear - Design of transverse reinforcement.

Module – 5

Design of End block: Different anchorage system and design of end block by latest IS codes.

Course outcomes:

The students will be able to:

CO 1. Understand the concepts of prestressing methodologies
CO 2. Determine the losses in prestressing and deflection in prestressed elements.
CO 3. Analyze the prestressing elements subjected to flexural loads.
CO 4. Design PSC beams to resist shear.
CO 5. Design end block of PSC beams as per IS codes.

Text Books

1. Krishna Raju, N. "Pre stressed Concrete", Tata McGraw Hill Publishing Company, New Delhi 2006

2. Krishna Raju. N., "Pre-stressed Concrete - Problems and Solutions",3rd Edition CBS Publishers and Distributors, Pvt. Ltd., New Delhi,2017.

3. Rajagopalan N, "Pre - stressed Concrete", Narosa Publishing House, New Delhi,2010.

Reference Books:

1. P. Dayaratnam, "Pre stressed Concrete Structures", Scientific International Pvt. Ltd.

2. Lin T Y and Burns N H, 'Design of Pre - stressed Concrete Structures' ,3rd Edition, John Wiley and Sons, New York, 2010.

3. Pundit G S and Gupta S P, "Pre - stressed Concrete", C B S Publishers, New Delhi,2019

4. IS: 1343: Indian Standard code of practice for Pre stressed concrete, BIS, New Delhi.

5. IS: 3370-Indian Standard code of practice for concrete structures for storage of liquids, BIS, New Delhi.

Web links and Video Lectures (e-Resources):

- Online study material
- NPTEL video lectures
- You Tube videos.

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

- Visit to a Pre stressing structural elements manufacturing yard and students have to submit a report

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Prefabricated Structures (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV742	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. To understand the principles of prefabrication, behavior and design of prefabricated components and structural connections.

Module – 1

NTRODUCTION: Need for prefabrication - Principles - Materials - Modular co-ordination – Standardization – Systems Production – Transportation – Erection - Disuniting of Structures.

Module – 2

PREFABRICATED COMPONENTS: Behavior of structural components – Large panel constructions – Construction of roof, floor slabs and Wall panels – Columns – Shear walls.

Module – 3

DESIGN PRINCIPLES: Design of Structural components – Beam, Column and Corbel – Stress limitations – Handling without cracking, handling with controlled cracking – Design for stripping forces.

Module – 4

JOINTS IN STRUCTURAL MEMBERS: Joints for different structural connections – Beam to Column, Beam to Beam, Column to Column, Column to Foundation, Connections between wall panels, Connections between floor panels - Dimensions and detailing – Design of expansion joints- Jointing Materials.

Module – 5

DESIGN FOR EARTHQUAKES AND CYCLONES: Progressive collapse – Codal provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones etc. - Importance of avoidance of progressive collapse.

Course outcomes:

The students will be able to:

CO 1: Comprehend the need for Prefabricated Structures and Standardise the Production for appropriate distinguished structures

CO 2: Analyse the structural behaviour of various Prefabricated Elements.

CO 3: Design the Prefabricated Structural Components as per Code and Specifications.

CO 4: Analyse the Design the joints and connections involved in Prefabricated Construction.

CO 5: Design Suitable Prefabricated Structures to Resist Progressive Collapse loads as per the standards.

Text Books

1. Hubert Bachmann and Alfred Steinle ," Precast Concrete Structures", Wiley VCH 2011.
2. Laszlo Mokk, "Prefabricated Concrete for Industrial and Public Structures", Akademiai Kiado, Budapest, 1964.

Reference Books:

1. PCI Design Hand Book, 6th Edition, 2004.
2. Handbook on Precast Concrete for Buildings, ICI Bulletin 02, First Edition, 2016.
3. A.S.G. Bruggeling and G.F.Huyghe, Prefabrication with concrete, Netherlands: A.A. Balkema Publishers, 1991.
4. Glover C.W, Structural Precast Concrete, Asia Publishing House, 1965.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Design Concept in Building Services (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV743	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Learn the importance of sanitation, domestic water supply, plumbing and fire services
2. Understand the concepts of heat, ventilation and air conditioning
3. Develop technical and practical knowledge in Building Services.

Module – 1

Water Supply and its Services: Water requirements for different types of buildings, simple method of removal of impurities, water saving practices and their potential Service connection from mains, sump and storage tank, types and sizes of pipes, special installation in multistoried buildings. Material, types of fixtures and fitting for a contemporary bathroom– taps –quarter turn, half turn, ceramic, foam flow etc, hot water mixer, hand shower Rainwater harvesting to include roof top harvesting, type of spouts, sizes of rainwater pipes and typical detail of a water harvesting pit.

Module – 2

Heat Ventilation and Air Conditioning (HVAC): Behavior of heat propagation, thermal insulating materials and their co-efficient of thermal conductivity. General methods of thermal insulation: Thermal insulation of roofs, exposed walls. Ventilation: Definition and necessity, system of ventilation. Principles of air conditioning, Air cooling, Different systems of ducting and distribution, Essentials of air-conditioning system.

Module – 3

Electrical and Fire Fighting Services: Electrical systems, Basics of electricity, single/Three phase supply, protective devices in electrical installation, Earthing for safety, Types of earthing, ISI Specifications. Electrical installations in buildings, Types of wires, Wiring systems and their choice , planning electrical wiring for building, Main and distribution boards, Principles of illumination, Classification of buildings based on occupancy, causes of fire and spread of fire, Standard fire, Firefighting, protection and fire resistance, Firefighting equipment and different methods of fighting fire., means of escape, alarms, etc., Combustibility of materials, Structural elements and fire resistance, Fire escape routes and elements, planning and design. Wet risers, dry risers, sprinklers, heat detector, smoke detectors, fire dampers, fire doors, etc. Provisions of NBC.

Module – 4

Plumbing and Fire Fighting Layout of Simple Buildings: Application of above studies in preparing layout and details - Plumbing layout of residential and public buildings, Fire fighting layout, Reflected ceiling plan of smoke detectors / sprinklers, etc.

Module – 5

Engineering Services: Engineering services in a building as a system, Lifts, escalators, cold and hot water systems, waste water systems and electrical systems. Pumps and Machineries: Reciprocating, Centrifugal, Deep well, Submersible, Automatic pumps, Sewerage pumps, Compressors, Vacuum pump – their selection, installation and maintenance – Hot water boilers

Course outcomes:

The students will be able to:

CO 1: Describe the basic principles of water supply, drainage, and solid waste management in building design.

CO 2: Discuss the fundamentals of HVAC systems and integrate them into building design for optimal indoor environment control.

CO 3: Implement electrical safety measures and fire protection systems in building design according to national standards.

CO 4: Interpret the plumbing and firefighting layouts for residential and public buildings.

CO 5: Understand the integration and maintenance of engineering services, including lifts, escalators, and pumps, within building systems.

Reference Books

1. Technical teachers Training Institute (Madras), Environmental Engineering, Tata McGraw Hill publishing Co. Ltd.
2. M.David Egan, "Concepts in Building Fire Safety", john wiley & sons,1978.
3. O.H.Koenigsberger, "Manual of Tropical Housing and Building", Universities Press,1975.
4. E.G.Butcher, "Smoke control in Fire-safety Design",London : E. & F. N. Spon,1979.
5. E.R.Ambrose, "Heat pumps and Electric Heating", John and Wiley and Sons Inc, New York,1966.
6. Handbook for "Building Engineers in Metric systems", NBC, New Delhi,1963.
7. Kamala & DL Kanth Rao, "Environmental Engineering", Tata McGraw Hill publishing co. Ltd,1988

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in
- https://swayam.gov.in

Activ ity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Assignment to students on building service components

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Ground Water Hydraulics (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV744	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Realize the significance of Groundwater and interpret characteristics of aquifers
2. Quantify the Groundwater flow by different methods
3. Locate occurrence of groundwater and synthesize groundwater development
4. Asses ground water quality using models

Module – 1

Importance of Groundwater, Vertical distribution of groundwater, Occurrence in different types of rocks and soils Definition of -Aquifers, Aquifuge, Aquitard, Aquiclude, Confined and Unconfined aquifer Fundamentals of Ground water flow-Aquifer parameters, specific yield and specific retention, porosity, storage coefficient.

Module – 2

Permeability: Derivation of Darcy's law, Hydraulic conductivity, coefficient of permeability and Intrinsic permeability in isotropic, anisotropic soils.

Module – 3

Well Hydraulics-Steady flow: Steady One-dimensional flow, steady Radial flow in confined aquifer and Unconfined aquifer, derivation – Theiss method, Cooper and Jacob Method Solutions for Unsteady flow equations, interference of wells, image well theory

Module – 4

Groundwater exploration - Seismic, Electrical resistivity, Geophysical techniques Groundwater exploration by different logging techniques-Electrical Logging, induction logging,
Groundwater Development-Types of Wells, methods of construction, tube well design, Conjunctive use.

Module – 5

Quality of Groundwater and Groundwater Modeling Techniques-Sources of Salinity, Measures of water quality, Chemical analysis, Physical analysis**,** Chemical Analysis, Groundwater Samples Porous media models, Electric Analog Models, Digital Computer Models.

Course outcomes:

The students will be able to:

CO 1. Explain the importance of Groundwater
CO 2. Paraphrasing the Characteristics of aquifers
CO 3. Estimate the quantity of groundwater by various methods
CO 4. Analyse the zones of groundwater resource
CO 5. Analyse the quality of groundwater and understand Techniques of modeling

Text Books

1. Rghunath H M," Ground water", 3rd Edition, Newagepublishers, New Delhi,2007.
2. Todd K , "Groundwater Hydrology",3rd Edition, Wiley Eastern Publishers, New Delhi,2011
3. Bower.H, "Groundwater Hydrolog", McGraw Hill Publishers,New Delhi,2000.

Reference Books:

1. Garg Satya Prakash, "Groundwater and Tube wells", Oxford and IBH Publication, New Delhi,1993.
2. Walton W C," Groundwater Resources and Evaluation", Tata Mc Graw Hill Publishers, New Delhi,1970.
3. Micheal, D.M,, Khepar,,S.D, and Sondhi,S.K, "Water Wells and pumps " 2nd Edition, Mc GrawHill,Delhi Standard Book House, Delhi,2008.

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

- Seminars
- Pumping test Demonstrations
- Demonstrations of Hydraulic conductivity test in lab
- Video/NPTEL lecture notes

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Choice Based Credit System (CBCS)

SEMESTER - VII

Environmental Impact and Risk Assessment (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV745	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Identify the appropriate methodology to predict and assess the impacts of project on various aspects of environment.
2. Apply the concept of environmental impact assessment for various types of industries.
3. Develop a methodical approach on assessment of environmental impacts due to developmental activities.
4. Interpret the role of public participation in environmental decision-making process.

Module – 1

Introduction to the course: Relevance in the Global scenario. Financial bearing on the World Economy. Role in Environmental and Societal concerns, Global opportunities for EIA consultation, as an Integral Part of the Planning Process.

NEPA: Objective and Key provisions - Protocol on Strategic Environmental Assessment: Objective and Key provisions

Environmental Impact Assessment: Definition, Objectives, Types (Rapid and Comprehensive EIA), FONSI - Limitations of EIA - Initial Environmental Evaluation,

Flow scheme - Elements of EIA and EIS (Environmental Impact Statement)

Self-Study: Status of EIA in India

Module – 2

Step by step Procedure - Project Description; Description of The Environment; Anticipated Environmental Impacts and Mitigation Measures: Analysis of Alternatives; Environmental Monitoring Programme; Additional studies; Project Benefits; Environmental Cost Benefit Analysis.

Description of the Baseline Environment: Classification of environmental parameters. Purposes for defining the Environmental Setting; Selection of parameters, Monitoring of physical environmental parameters, Collection and interpretation of baseline data for various environmental attributes.

Module – 3

E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, EIA methods, Adhoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/Benefit Analysis.

Prediction and Assessment of Impact: Quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment. Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air Pollution Impact

Module – 4

Public Participation: Types, levels, Significance, Procedure and Issues.

Risk assessment: introduction and scope; project planning; exposure assessment; toxicity assessment; hazard identification and assessment; risk characterization; risk communication; environmental monitoring; community involvement; legal and regulatory framework; human and ecological risk assessment.

Module – 5

Environmental Audit & legislation: Objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, on-site activities, evaluation of Audit data and preparation of Audit report.

Self-Study: The Environmental Pollution Act, The water; Act, The Air (Prevention & Control of pollution Act.), Tribal Affairs Act, Wild life Protection Act.

Design based Problems (DP)/Open Ended Problem: Case studies and preparation of Environmental Impact assessment statement for various Industries.

Course outcomes:

The students will be able to:

CO 1: Identify the importance of EIA as an integral part of planning process, by distinguishing the need, elements and sequential procedures of EIA for any type of Developmental Activity.

CO 2: Analyze relevance of application of variable EIA Methodologies, on case to case basis.

CO 3: Evaluate feasibility of EIA carried on developmental projects.

CO 4: Propose the 'need' for and 'type' of relevant EIA methodologies for real-time developmental projects.

CO 5: Identify the latest techniques and technologies that can be incorporated for EIA studies.

Text Books

1. Barthwal R.R., Environmental Impact Assessment, New Age International Publications, 2002.
2. Larry Canter, Environmental Impact Assessment, 2nd Edition, McGraw-Hill Publications, 1996.

Reference Books

1. Y. Anjaneyulu, Environmental Impact Assessment Methodologies, 2 nd Edition, B.S. Publication, 2007.
2. Marriott B., Environmental Impact Assessment: A Practical Guide. McGraw-Hill, New York, USA, 1997.
3. Glasson J., Therivel R., Chadwick A., Introduction to Environmental Impact
4. Assessment. London, Research Press, UK, 1994.
5. Wathern P., Environmental Impact Assessment: Theory & Practice, Rutledge, London, 1992.
6. J. Glynn and Gary W. Heinke, Environmental Science and Engineering, Prentice Hall, Publishers, 1998.
7. Barrow, C.J., Social Impact Assessment: An Introduction. Oxford University Press, 2000.
8. Judith, P., Handbook of Environmental Impact Assessment. Blackwell Science, 1999.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Environmental Protection and Management (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV751	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Appreciate the need for Environmental protection.
2. Explore pollution prevention assessment team and implement waste minimization options.
3. Describe and interpret methods of the Environmental Management Systems according to ISO 14001 standards.
4. Audit Environmental Management systems for Organizations.
5. Critically evaluate tools and possibilities for Environmental Protection for various industries.

Module – 1

Introduction and Relevance of the course (w.r.t. Society, Employment and Economy), Unique Characteristics of Environmental Issues (Types and Examples), Environmental Stewardship (Evolution and Types), Environmental Management Principles (Types and Significance), Environmental standards – Rationale, Types (NAAQS, Freshwater Classification, Drinking Water Standard, Noise standards, Emission Standards), Classification of Environmental Impact (in lieu of Reduction Efforts)

Module – 2

ICC Business Charter for Sustainable Development (2015), India's National Policy Statement for Abatement of Pollution (1992), Charter on Corporate responsibility for Environmental protection (2003), Environmental Protection Act (1986), Hazardous Waste Management (Introduction, Types, Impacts, Treatment and Disposal), SAARA III, Basel Convention (Importance of Trans-boundary Movement, Conditions and Procedural Flow scheme)

Module – 3

EMS as per ISO 14001 (Flow scheme and explanation of each component), Environmental Aspect and Impact Analysis (Experiential Learning), Environmental Policy, Environmental Statement (Form V), Environmental performance indicators, Environmental performance Evaluation and Benchmarking, Non-conformance (Significance, Corrective and preventive actions)

Module – 4

EMAS (Flow scheme), EIA (Types, Flow scheme and explanation of each component), Types of Environmental Audits (incl. Waste audit, due-diligence audit, compliance audit), Environmental management system audits as per ISO 19011 (pre-EMS and EMS audit), Procedures and Guidelines to conduct Environmental Audit, Roles and qualifications of Auditors.

Module – 5

Process Flow scheme and Applications EMS in Cotton Textile Industries
Process Flow scheme and Applications EMS in Pulp and Paper Industries
Process Flow scheme and Applications EMS in Tanneries.

Course outcomes:

The students will be able to:

CO 1: Compare Rationale for existing Objectives, Standards, Policies, Principles and Opportunities for Environmental Management and Protection.

CO 2: Appreciate the existing policies complying with international environmental management.

CO 3: Discuss the framework and relevance of Environmental Management Systems in accordance with to ISO 14001.

CO 4: Audit pollution prevention assessment measures and recommend waste minimization options.

CO 5: Review and Implement Environmental Management systems for various Industries and Organizations.

Text Books

1.Christopher Sheldon and Mark Yoxon, "Installing Environmental management Systems – a step by step guide", Earthscan Publications Ltd, London, 1999.

2.Paul L. Bishop, "Pollution Prevention: Fundamentals and Practice", McGraw- Hill International, Boston, 2000.

3.Ann Arbor, "Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations", NSF International, Michigan, Second Edition, 2001.

References Books:

1.Bureau of Indian Standards, ISO 19011: 2002, "Guidelines for quality and/or Environmental Management System Auditing", Bureau of Indian Standards, New Delhi, 2002.

2.Bureau of Indian Standards, ISO 14001 Certification - Environmental Management Systems: A Practical Guide for Preparing Effective Environmental Management Systems, Bureau of Indian Standards, New Delhi.

3.Peavy, H.S, D.R. Rowe and T.George, "Environmental Engineering", New York: McGraw Hill, 1987..

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

- Peer learning: Cleaner Technology-Cleaner Production, Zero Discharge Technology (Closing the Loop) followed by Group Discussion upon Case Study-based interaction and PPT presentation for various industries.
- Industrial Visit – Visit to STPs
- Self-study: MOOC - https://unccelearn.org/course/view.php?id=131&page=overview

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Green Buildings (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV752	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Understand the definition, concept & objectives of the green building.
2. Understand Green building rating systems and its applications.
3. Understand the criteria for site selection and building construction.
4. Recognize the concept and utilization of solar and energy efficient building.
5. Understand Concepts of Green Composites

Module – 1

Introduction to Green Buildings: Features of green buildings, benefits of green buildings towards sustainable development. Green building rating systems – GRIHA, BREEAM, IGBC and LEED, overview of the criteria as per these rating systems.

Module – 2

Site selection and planning: Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect, maximize comfort by proper orientation of building facades, day lighting, ventilation, etc,.

Module – 3

Energy Efficiency: Concepts of embodied energy, Operational energy and life cycle energy. Methods to reduce operational energy: Energy efficient building, Envelopes, energy efficient appliances for heating and air-conditioning systems in buildings.

Module – 4

Utility of Solar Energy in Buildings: Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings. Overview of Green building Codes, Case study.

Module – 5

Green Composites for Buildings: Concepts of Green Composites. Methods to reduce embodied energy in building materials**,** Use of natural and renewable materials like bamboo and stabilized mud blocks. Case study.

Course outcomes:

The students will be able to:

CO 1: Interpret the Green buildings and Green rating system.

CO 2: Identify the green building concept for site selection and planning.

CO 3: Comprehend the Principle and concept of energy efficiency in construction.

CO 4: Elucidate concepts of solar energy utilization in buildings.

CO 5: Apply the Concepts of Green Composites in building construction.

Text Books

1. HarharaIyer G, Green Building Fundamentals, Notion Press,2022
2. Dr. Adv. Harshul Savla, Green Building: Principles & Practices", Notion Press ,2021
3. Vinod B R and Shobha R "Green Building Materials and Techniques" Notion Press,2023.

References Books:

1. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
2. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.
3. Charles J. Kibert, Sustainable Construction – Green Building Design and Delivery, John Wiley & Sons, New York, 2008.
4. Regina Leffers, Sustainable Construction and Design, Pearson / Prentice Hall, USA, 2009.
5. Green Building: Principles and Practices in Residential Construction" by Sam Kubba Publisher: Tata McGraw Hill Education Edition: 1st Indian Edition (2012), ISBN: 978-0070704723
6. Utility of Solar Energy in Buildings by Dorota Chwieduk, Academic Press Publisher, 1st Edition (2014), ISBN 978-0124105140.
7. Green Building Materials: A Guide to Product Selection and Specification by Ross Spiegel, Dru Meadows, John Wiley & Sons Publisher, 3rd Edition (2010), ISBN 978-0470538043.
8. https://www.youtube.com/watch?v=THgQF8zHBW8
9. **https://**www.youtube.com/watch?v=DRO_rIkywxQ
10. https://archive.nptel.ac.in/courses/105/102/105102195/
11. https://www.youtube.com/watch?v=VE2tpwGCN0U
12. http://www.digimat.in/nptel/courses/video/105102195/L08.html

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

- Visit to Industry to understand manufacturing of green material/green building

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Choice Based Credit System (CBCS)

SEMESTER - VII

Conservation of Natural Resources (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV753	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Learn types of land forms, soil conservation and sustainable land use planning.
2. Apprehend water resources, types, distribution, planning and conservation. Water pollution and types of uses.
3. Know the types of minerals and rocks.
4. Know the atmospheric composition of air, pollution and effects on human beings, animals and plants. Air pollution control.
5. Apprehend basics of biodiversity and ecosystems.

Module – 1

Land: Land as a resource, types of lands, conservation of land forms, deforestation, effect of land use changes. Soil health, ecological and economic importance of soil, impact of soil degradation on agriculture and food security, need for soil conservation, sustainable land use planning.

Module – 2

Water: Global water resources, Indian water resources, Resources system planning. Water use sectors-domestic, industrial, agriculture. Water deficit and water surplus basins in India, equitable distribution, Inter-basin water transfers, Interlinking of rivers – Himalayan component, peninsular component, issues involved. Ground water, its potential in India, conjunctive use, recharge of ground water. Contamination of ground water, sea water ingress, problems and solutions.

Module – 3

Air: Introduction, composition, sources and classification of air pollutants, National Ambient Air quality standards (NAAQS), Air quality index, effects of air pollution on human health. Economic effects of air pollution. Control of air pollution by equipment, smoke and its control. Ozone depletion –impacts, photochemical changes.

Module – 4

Biodiversity: Introduction, Flora and Fauna, Importance of biodiversity, Economic values-medicinal plants, drugs,fisheries biogeochemical cycling. Threat to biodiversity, natural & anthropogenic disturbance, habitat loss. Conservation of biodiversity, National parks, wild life sanctuaries, zoological gardens, gene banks, pollen culture, ecological restoration, social forestry. Ecosystem: Definition, Types: forest, grass land, marine, desert, wetlands, estuarine, lotic,lentic. Abiotic & biotic components of ecosystem.

Module – 5

Global warming: concept, indicators, factor and effects. Global climate change-indicators, health impacts, effect on biodiversity. Introduction to global efforts in conservation of biodiversity. .EIA regulations in India, status of EIA in India, list of projects needing environmental clearance under EIA notifications. Case study of hydro power/ thermal power projects

Course outcomes:

The students will be able to:

CO 1. Apprehend various components of land as a natural resource and land use planning.
CO 2. Know availability and demand for water resources as applied to India.
CO 3. Analyse the components of air as resource and its pollution.
CO 4. Discuss biodiversity & its role in ecosystem functioning.
CO 5. Critically appreciate the environmental concerns of today.

Text Books

1. Modi, P.N., "Irrigation Water Resources and Water Power Engineering". Standard Book House, New Delhi. 10th Edition 2019.
2. Raghunath, H.M., "Groundwater" ,3rd Edition, New Age International Publishers, New Delhi, 2007.
3. Krishnan, M.S., "Geology of India & Burma". CBS publishers, New Delhi, 2017.
4. P.Jaya Rami Reddy, "A Textbook of Hydrology", University Science Press, New Delhi, 2011.
5. M N Rao and H V N Rao, "Air pollution", McGraw Hill Publications 2017.
6. Krishnamurthy K.V., "An advanced textbook of Biodiversity- principle & practices." Oxford and IBH publications Co.Pvt ltd, New Delhi. 2004.

Reference Books:

1. Odum, E.P., "Fundamentals of Ecology", W.B sounders, Philadelphia, USA, 1971
2. Singh J.S, Singh S.P & Gupta, S.R., "Ecology, environment and resource conservation", Anamaya publications,2006.
3. Edmond A. Mathez & Jason E.Smerdon, "Climate Change: The science of Global warming and our energy feature", Columbia University Press, 2009.
4. National Council of Applied Economic Research, "Economic Impact of Interlinking of Rivers Program", Revised Final Report, April 2008.
6. http://nwda.gov.in/content.
7. Madhav Gadagil, "Biodiversity and Indias degraded lands", Indian Academy of Sciences, Volume 22-No 2/3, http://www.jstor.org/pss/4314063

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

- Seminars /Quiz (to assist in GATE preparations)
- Demonstrations in lab
- Self-Study on simple topics
- Simple problems solving by Excel, C+
- Virtual lab experiments

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Intelligent Transportation Systems (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV74	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. Learn the foundational knowledge on ITS and data collection techniques adopted for ITS.
2. Understand the role of various application of communication systems in ITS.
3. Gain knowledge on functional areas of ITS in diverse urban and rural contexts.
4. Skill up with the design, implementation, and management of ITS.
5. Gain the knowledge on application of ITS in developing countries.

Module – 1

Introduction to Intelligent Transportation Systems (ITS): Definition, Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

Module – 2

Communications in ITS: Information Management, Traffic Management Centres (TMC). Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centres; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts.

Module – 3

ITS functional areas: Advanced Traffic Management Systems (ATMS), Advanced Traveller Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

Module – 4

ITS User Needs and Services: Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

Module – 5

ITS applications: Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing, Transportation network operations, commercial vehicle operations, public transportation applications; Automated Highway Systems - Vehicles in Platoons – Overview of ITS implementations in developed countries, ITS in developing countries.

Course outcomes:

The students will be able to:

CO 1: Acquire the foundational knowledge on ITS and data collection techniques adopted for ITS.

CO 2: Explain the role of various application of communication systems in ITS.

CO 3: Understand and illustrate the functional areas of ITS in diverse urban and rural context.

CO 4: Design, implement, and manage ITS that enhance user needs and services.

CO 5: Contribute and develop the ITS that improve mobility, efficiency, safety, and sustainability.

Text Books

1. Choudury M A and Sadek A, "Fundamentals of Intelligent Transportation Systems Planning", Artech House, 2003.
2. Kan Paul Chen, John Miles, "Recommendations for World Road Association (PIARC)" ITS Hand Book, 2000.

Reference Books

1. Sussman, J. M., "Perspective on ITS", Artech House Publishers, 2005.
2. Pradip Kumar Sarkar, Amit Kumar Jain, "Intelligent Transport Systems", PHI Learning Publisher, 2018.
3. US Department of Transportation, "National ITS Architecture Documentation", 2007 (CDROM). Turban. E and Aronson. J. E, "Decision Support Systems and Intelligent Systems", 7th Edition, Pearson Publisher, 2004.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/105107210
- https://www.civil.iitb.ac.in/tvm/nptel/591_ITS_1/web/web.html

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VII

Sustainable Development Goals (3:0:0) 3

(Effective from the academic year 2024-25)

Course Code	21CV755	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course objectives:

This course will enable students to:

1. To introduce the fundamentals and components of Sustainable Development
2. To provide details of Sustainable Cities
3. Understand the Sustainable Development Goals.

Module – 1

Sustainable Development: Introduction to Sustainable Development Economic Growth and Progress, Continuing Poverty, Environmental Threats, Business as Usual Versus Sustainable Development

Module – 2

Sustainable Cities: The Patterns of Urbanization Around the World, development of Sustainable city, Smart Infrastructure, Urban Resilience, Planning for Sustainable Development.

Module – 3

Curbing Climate Change: The Basic Science of Climate Change, Consequences, Mitigation, Adaptation, Mitigation Policies.

Module – 4

Saving Biodiversity: Concept of Biodiversity, Biodiversity Under Threat, Oceans and Fisheries, Deforestation International Dynamics.

Module – 5

Sustainable Development Goals: Introduction to Sustainable Development Goals, Goal-Based Development, Financing for Sustainable Development, Principles of Good Governance, Feasibility of Sustainable Development.

Course outcomes:

The students will be able to:

CO 1: Understand the core principles of sustainable development.

CO 2: Plan sustainable development for urban scenarios using smart infrastructure

CO 3: Interpret mitigation and adaptation policies for climate change.

CO 4: Identify threats and solutions to save biodiversity.

CO 5: Interpret sustainable development goals for feasibility and good governance.

Text Books

1. Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep Chachra, P.S. Janaki Krishna “Smart Cities for Sustainable Development” Springer, 2022
2. The Sustainable Development Goals Report Kindle Edition, Department of Economic and Social Affairs, 2020
3. Yacine Aèt Kaci ,”The Sustainable Development Goals”, United Nations,2017.

Web links and Video Lectures (e-Resources):

NPTEL VIDEOS.

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

- Visit to Industry to understand sustainability goals adopted