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

V and VI Semester Scheme and Syllabus
2021 Scheme - Autonomous

Approved in the BoS meeting held on 27.05.2023

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.

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

(An Autonomous Institution affiliated to VTU, Belagavi)
Yelahanka, Bengaluru-560064

Date: 14.06.2023

CIE and SEE Pattern for 2021 Scheme
(Applicable from the AY 2021-22 onwards)

Important Note:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Examinations (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for SEE minimum passing mark is 35% of the maximum marks (18 marks out of 50). The student is declared as a pass in the course if he / she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

4 CREDIT and 3 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs to be conducted for 40 Marks (90 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks.**
- Assignments: 2 assignments of each 10 marks, total **20 marks**.
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score 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 from each module.**

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: 3 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks**.
- Assignments: 2 assignments of each 10marks, total **20 marks.**
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score 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.

1 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks.**
- Assignments: 2 assignments of each 10marks, total **20 marks.**
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score 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 COURSES

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 minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks and scale down to 50 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.

CoE 16/06/2023 Dean AA 16/06/2023 Principal 19/6/23

Scheme of V Semester

BMS INSTITUTE OF TECHNOLOGY AND 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: V**

Sl. No.	Course category	Course Code	Course Title	Teaching Dept.	Teaching Hours/Week				Credits	Examination			
					L	T	P	PW		Duration	CIE Marks	SEE Marks	Total Marks
1	HS	21HSS51	Management and Entrepreneurship	CV	3	0	0	0	3	3	50	50	100
2	AEC	21AEC52	Cyber and Intellectual Property law	CV	0	2	0	0	1	1	50	50	100
3	INT	21INT53	Innovation / Entrepreneurship / Societal Internship	CV	0	0	0	6	3	-	100	-	100
4	PE	21CV54X	Professional Elective -I	CV	3	0	0	0	3	3	50	50	100
5	PC	21CV55	Soil Mechanics and Foundation Engineering	CV	2	2	0	0	3	3	50	50	100
6	PC	21CV56	Design of R.C.C. and Steel Elements	CV	2	2	0	0	3	3	50	50	100
7	PC	21CV57	Highway Engineering	CV	3	0	0	0	3	3	50	50	100
8	PC	21CVL58A	Environmental Engineering Laboratory	CV	0	0	2	0	1	3	50	50	100
9	PC	21CVL58B	Software Application Laboratory	CV	0	0	2	0	1	3	50	50	100
10	PC	21CVL58C	Concrete Technology Laboratory	CV	0	0	2	0	1	3	50	50	100
TOTAL					**13**	**6**	**6**	**6**	**22**	**-**	**550**	**450**	**1000**
					31								

Professional Elective- (Group- I)		
1.	21CV541	Integrated Solid Waste Management
2.	21CV542	Alternative Building Materials
3.	21CV543	Advanced Concrete Technology
4.	21CV544	Applications of Remote Sensing and GIS in Civil Engineering
5.	21CV545	Sustainability Concepts in Civil Engineering

V Semester Syllabus

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Management and Entrepreneurship (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	21HSS51	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. Define the strategic, tactical, and operational roles and functions of management.
2. Use critical thinking to formulate and execute managerial entrepreneurial strategies, plans, and procedures.
3. Understand the Ideation Process, creation of Business Model, Feasibility Study and sources of funding.

Module – 1

Management: Significance and Scope of Management, Importance of the management and entrepreneurship in Economic growth of Nation, Impact of the entrepreneurship on Societal Problems for Sustainable Solutions. Management in the perspective of National Economy, Career, Innovations and trends. Definition, Management functions, Levels of management, Roles of manager, Managerial skills, Management & Administration.

Planning: Importance, Types, Steps and Limitations of Planning; Decision Making types and Steps in Decision Making. (8 Hours)

Module – 2

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management, Departmentalization.

Committees: Meaning, Types of Committees; Centralization Vs Decentralization of Authority, Responsibility. Staffing: Importance, Recruitment and Selection Process.

Directing and Controlling: Meaning and Requirements of Effective Direction.

Motivation: Nature of Motivation, **Motivation Theories** (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory). **Communication:** Meaning, Importance and Purposes of Communication. **Leadership:** Meaning, Characteristics, Behavioral Approach of Leadership. **Coordination:** Meaning, Types, Techniques of Coordination; **Controlling:** Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, and Steps in Control Process. (8 Hours)

Module – 3

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship. Theories of Entrepreneurship.

(8 Hours)

Module – 4

Entrepreneurial Project Development: Idea Generation and Feasibility Analysis- Idea Generation; Creativity and Innovation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities.

(Case study/Activity to demonstrate entrepreneurial abilities) (8 Hours)

Module – 5

Social Responsibilities of Business: Meaning of social responsibility, social responsibilities of business towards different groups, social audit, business ethics and corporate governance.

Self-study topics:

1. Sources of funding, Working capital management and Taxation benefits.
2. Market evaluations and turnaround strategies.
3. Policies governing SME's
4. Perform market survey on sectors promoted by the government and submit the report for the same.

Summary: The student will explore entrepreneurial opportunities and gather all relevant data for starting a venture. (8 Hours)

Course outcomes:

The students will be able to:

CO1: Comprehend the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business

CO2: Categorise the functions of Managers, Entrepreneurs and their social responsibilities

CO3: Analyse the business environment components in developing a business plan.

CO4: Individually and in teams identify, conceptualize, and develop solutions for successful entrepreneurial management.

Textbooks:

1. P. C. Tripathi., P. N. Reddy., "Principles of Management." 6th Edition, McGraw-Hill Education, 2017.
2. Dr. Vasant Desai. "Dynamics of Entrepreneurial Development and Management", 6th Edition,Himalayan Publishing House, 2019.

References:

1. Poornima. M. Charantimath., "Entrepreneurship Development Small Business Enterprises", Pearson Education, 2008.
2. Robert. D. Hisrich., Mathew. J., Manimala., Michael. P. Peters., Dean. A., Shepherd, "Entrepreneurship", 8th Edition,Tata McGraw Hill Publishing Co. ltd, 2012.
3. Harold Koontz, Heinz Weihrich., "Essentials of Management: An International, Innovation and Leadership perspective", 10th Edition, McGraw Hill Education, 2016.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

Semester – V

Cyber and Intellectual Property Law (0:1:0)1

(Common to all Branches)

(Effective from the academic year 2023-24)

Course Code	21AEC52	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:2:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	1 Hour

Course Objectives:

This course will enable students to:

1. Understand the concept of IP, copyright, patent and its protection.
2. Explain the scope of trademarks, industrial and IC layout design.
3. Enhance their knowledge on IP management and related agreements.
4. Understand overview of Cyber law and cyber policies.
5. Identify different types of cybercrime and security measures.

Module – 1

Introduction to IP: Various forms of IP, Intellectual property verses physical property, importance of intellectual property.

Copyright: Different classes of copyright work, ownership of copyright, term of copyright, infringement of copyright.

Patent: Fundamentals of patent, condition for grant of patent, inventions those are not patentable, right of patentee, transfer of patent right, Infringement of patent right, challenges in patents. Case study on prior art search and patent drafting. (03 Hours)

Module – 2

Trademarks: Introduction to trademark, developing trademark, term of trademark, collective marks, certification trademarks, Infringement of trademark.

IC Layout Design Introduction to Semi-Conductor Integrated Circuits Layout, The Semi-Conductor Integrated Circuits Layout Design (SICLD) Act, 2000.

Industrial Design: Design registration, Industrial design act 2000.

Case study on infringement of Industrial Design (03 Hours)

Module – 3

Creating IP: Need for creating IP, Process of development of IP and knowledge.

TRIPS (Trade-Related aspects of IPR): Need and objectives, Agreement on trip, scheme of agreements. WIPO: Objectives, functions, memberships

Treaties: Patent cooperation Treaty(PCT)**:** filing patent under PCT, Different stages and procedure in PCT filing. Paris Convention Treaty**:** filing patent under Paris convention treaty, Different procedure stages

IP Management: Defining IP management, need and importance of IP management,

. Undertaking IP intelligence, acquisition of IP, managing IP portfolio, commercialisation of IP, protecting IP. Case studies on PCT filing. (03 Hours)

Module – 4

Cyber Law: introduction to Indian cyber law, need for cyber law, jurisprudence of cyber law, importance of cyber law.

IT Act: Objective and scope of The Indian Information Technology Act 2000.

Cyber Crimes: What constitute cybercrime, Important cybercrimes.
C**yber policies:** Need for an information security policy, information security standard-ISO, introduction to various security policies. Case study on cybercrime. (03 Hours)

Module – 5

Phishing; Sspear phishing, protecting from phishing attack, cyber stalking, how to prevent cyber stalking.
Hacking: types, Protection of computers from intrusion and types, different types of hackers and their operation.
Data theft: IT act related to data theft, Spam E-mail, IT act related to spam mail, Software piracy, types, legal penalties, Identity theft, prevention practice
Electronic and digital signature: Role of electronic signature, types of electronic signature, guidelines for electronic signature. Creation of digital signature, digital signature in India.
(03 Hours)

Course Outcomes:
The students will be able to:
CO1: Describe the concept of copyright and patent and its protection.
CO2: Explain the scope of trademarks, industrial and IC layout design.
CO3 Describe Intellectual property management and related agreements.
CO4: Understand overview of Cyber law and cyber policies.
CO5: Discuss different types of cybercrime and security measures.

Text Books

[1]	V Appukutty, Cyber Crime & Law, Coral Publishers, 2022
[2]	Surya Prakash Tripati, Ritendra Goel, Praveen Kumar Shukla, Introduction to information Security and Cyber Laws, Dream Tech Press,2021
[3]	Neeraj Pandey, Khushdeep Dharni, Intellectual Property Rights, PHI Learning, 2014

References

[1]	Prabhuddha Ganguli, Intellectual Property Rights, Tata Mc-Graw –Hill, 2017
[2]	S R Myneni, Patent Right Creation and Registration, Asia Law House, 2017
[3]	Marjie T. Britz, Computer Forensics and Cyber Crime: An Introduction, Pearson, 3rd Edition, 2004.
[4]	Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Cengage Learning, 4th Edition, 2010.

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

Choice Based Credit System (CBCS)

SEMESTER – V

Innovation / Entrepreneurship/ Societal Internship (0:0:0:3) 3

(Common to all Branches)

(Effective from the academic year 2023-24)

Course Code	21INT53	CIE Marks	100
Teaching Hours/Week (L:T:P:PW)	0:0:0:6	SEE Marks	--
Total Number of Contact Hours	4 weeks	Exam Hours	--

Schedule:

Scheduled during the intervening period of IV and V semester

Course Outcomes: students will be able to

1. Acquire academic/ career/ personal overall skill/ knowledge development.
2. Perceive ample opportunities for professional growth and achievement with relevance to society and environment.
3. Expose to real job world environment and gain practical knowledge with experience.
4. Build leadership qualities, teamwork, collaborations, cooperation, and facility in using virtual workspace.
5. Intensify creativity, artistry, curiosity, imagination, innovation,, incubation, entrepreneurial skills and personal expression.
6. Write report on the work/ project carried out with presentation.

During the intervening period of IV and V semesters, students shall be ready for industrial experience. Therefore, they shall choose to undergo Internship involving Innovation / Entrepreneurship/Societal related activities. Students may choose to work on innovation or entrepreneurial activities or both resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case students want to undergo internship at his/her family business, he /she shall will be permitted provided, a declaration by a parent is submitted directly to the Principal of the institution.

Innovation

Innovation refers to a new or improved product or process or a combination thereof that differs marginally or significantly from the unit's previous product. An innovation center is a place where students are encouraged to implement the innovative ideas formed through imagination, brainstorming sessions, design thinking and associated activities to bring them to reality. It is a place, where creative minds are shaped.

Entrepreneurship

Entrepreneurship refers to setting up a new business or businesses, taking on financial risks inthe hope of profit. It involves investment to undertake production along with arranging inputs like land, labour, material and capital, introducing new techniques and products, identifying new sources for the enterprise, etc.

Incubation Center

An organized unit designed for innovation as well as to accelerate the growth and success of new entrepreneurial companies through mentorship and an array of business support resources and services that could include physical space, capital, coaching, common services, and networking connections.

Startup

An entity that develops a business model based on either product innovation or service innovation and makes it scalable, replicable and self-reliant.

Societal (Social) related activities

Short term internship at villages, slums or urban areas can be under social internship. The internship will be more fruitful, if students work in teams. The teams can select one or more fields to do their best in the field of agriculture, watershed management, wastelands development, non-conventional energy, low cost housing, sanitation, nutrition and personal hygiene, schemes for

skill development, income generation, blood bank, government scheme such as Swachch Bharat, Accessible India, Digital India, Beti Bachao and Beti Padhao, Environment and Energy Conservation and Education, legal aid, consumer protection and allied field including Indian Red Cross Society, National Cadet Corps, Bharat Scouts and Guides.

Places for Innovation/Entrepreneurial Activities
Students shall carryout Innovation or Entrepreneurial activities or both at the Incubation Center and Entrepreneurship Cell of the parent institution or elsewhere such as ATAL Incubation Centers [A flagship of Atal Innovation Mission (AIM), NITI Aayog for promoting the culture of innovation and entrepreneurship in India], institutes of national importance, public sector units, IT companies, government organizations, and non-governmental organizations, industries including MSME, etc. Institutes, should deter students to opt for internships at places established for commercial benefits.

Rubrics for Internal Evaluation (Total Marks: 100)

Indicator	Poor	Average	Good	Excellent
Acquired skills or knowledge (10 Marks) (CO1)	Not gained any skill / knowledge **or** Attended a few sessions. **0-1 Marks**	Partial skill/Knowledge gained. Only Block Diagram/ Notes/Description **2-4 Marks**	Average skill/knowledge gained. Lack of Technical/ Knowledge. **5-7 Marks**	Complete skill/ knowledge gained. All Skills Acquired. **8-10 Marks**
Presentation (10 Marks) (CO5)	Absence for presentation **or** Presented after the due date. **0-1 marks**	Information is lacking/unclear & communicated in such a way that the audience can not understand the purpose of the evidence of work and internship experiences. **2-4 Marks**	Information is not presented in a clear manner and many details are missing related to the evidence work and internship experiences. **5-7 Marks**	Information is presented in such a way that the audience can understand the purpose of the evidence of work and internship experiences. **8-10 Marks**
Weekly report (10 Marks) (CO6)	Weekly report not submitted **or** Few days report was submitted. **0-1 Marks**	One Weekly report submitted. **2-4 Marks**	Two weekly reports submitted. **5-7 Marks**	All three weekly reports submitted **8-10 Marks**
Practical Knowledge (10 Marks) (CO3)	Not gained any practical knowledge **or** Able to define basic concepts. **0-1 Marks**	Partial practical Knowledge gained. Less hands-on experience. **2-4 Marks**	Average practical knowledge gained. Only few models are exhibited. **5-7 Marks**	Complete practical knowledge gained. **8-10 Marks**
Societal and environment	No relevance to society or	Partial relevance to society or	Average relevance to society or	Directly Relevant to society or

al relevance (10 Marks) (CO2)	environment (At-least one relevance) **0-1 Marks**	environment. **2-4 Marks**	environment. **5-7 Marks**	environment. **8-10 Marks**
Viva (10 Marks) (CO4)	Does not know any information **or** Fair leadership quality/ teamwork/ cooperation. **0-1 Marks**	Provides irrelevant information for all questions. Good leadership quality/ teamwork/ cooperation. **2-4 Marks**	Provides incomplete information for all questions. Better leadership quality/ teamwork/ cooperation. **5-7 Marks**	Provides complete information for all questions. Outstanding leadership quality/ teamwork/ cooperation. **8-10 Marks**
Report (40 Marks) (CO6)	Does not submit the report. **0 Marks**	Report submitted does not fulfill the prescribed format/submission after one weeks of the deadline. **1-24 Marks**	Report submitted partially fulfills the prescribed format/ submission after one weeks of the deadline. **25-32 Marks**	Report submitted fulfills the prescribed format / submission in par with the deadline. **33-40 Marks**

CIE and SEE Details for Scheme 2021

Course	CIE (Minimum Passing Marks 40% of Max Marks)		SEE (Minimum Passing Marks 35% of Max Marks)	
	Max Marks	Min Passing marks	Max Marks	Min Passing marks
Innovation / Entrepreneurship/ Societal Internship	**100**	**40**	**-**	**-**

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Integrated Solid Waste Management (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	21CV541	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. Distinguish between the different elements of solid waste management.
2. Infer upon the existing solid waste and hazardous waste management system and to analyze their draw backs comparing with statutory rules.
3. Analyze different processing technologies and to study conversion of municipal solid waste to compost or biogas.
4. Evaluate landfill site for compliance with safety aspects w.r.t. hazardous and sanitary chemical reactions.

Module – 1

Introduction to the course: Relevance in the Global scenario. Financial bearing on the World Economy. Role in Environmental and Societal concerns. Internship/Job opportunities as consultant or engineer in remediation, processing or treatment w.r.t solid wastes. Need for hazardous waste management.

Functional elements of solid waste management. Sources of solid waste, Types of solid Waste, Composition of Municipal Solid Waste, Physical, Chemical & Biological properties.

Solid Waste generation: Generation rate, Factors affecting generation rates, Measures & Methods used to assess solid waste quantities. Solid waste management 2000 rules with, 2016 amendments**.**

Self-Learning Component: Literature Study on trend for generation rates of Solid wastes in Karnataka, and Globally.

(9 Hours)

Module – 2

Collection& Transportation: Types of collection systems, collection equipment, Analysis of collection systems, Collection Routes. route optimization techniques.

Transfer & Transport – Need of transfer operation, Types of Transfer stations, transport means and methods, Transfer station design requirements.

Collection: Collection of solid waste- services and systems, Equipment, Transportation, route optimization.

(8 Hours)

Module – 3

Treatment / Processing Techniques: Size reduction, Size separation, Density separation, Magnetic separation, Densification (Compaction), Materials handling and Equipment for the above operations.

Biological processing: Composting: Aerobic and anaerobic composting, factors affecting Composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes & Vermicomposting, Anaerobic Digestion: Process Technology.

Chemical reduction: Incineration: Process – 3 T's, factors affecting incineration process, incinerators – types, prevention of air pollution, pyrolysis, design criteria for incineration. Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance and reuse.

Self-Study: Latest Treatment Technologies through Literature studies.

(8 Hours)

Module – 4

Sanitary Land Fills: Different types, trench area, Ramp and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate & gas collection and control methods, geo-synthetic fabrics in sanitary landfills**.**

Design based Problems (DP)/Open Ended Problem: Analysis of Compliance wrt Solid Waste Management at different places.

Construction and Demolition Waste: Sources, Types, Collection, Treatment and Disposal.

(8 hours)

Module – 5

Hazardous Waste Management: Definition, characterises of hazardous wastes, Generators/Sources, classification, collection, storage and transportation, Treatment and Disposal

Biomedical Waste: Definition - Toxicity evaluation of Hospital waste - Healthcare waste generation - Regulatory aspects of Biomedical Waste.

E-Waste: Definition - Toxicity evaluation - generation - Regulatory aspect –Extended Manufacture Responsibility.

(7 hours)

Course Outcomes: The students will be able to:

CO1: Appraise E-waste, biomedical, hazardous and municipal solid waste management systems.

CO2: Analyze different elements of municipal solid waste management system.

CO3: Evaluate scientific methods for E-waste, biomedical, hazardous and municipal solid waste management.

CO4: Propose suitable processing systems and disposal methods for E-waste, biomedical, hazardous and municipal solid wastes.

CO5: Identify the latest technologies in the processing & treatment of E-waste, biomedical, hazardous and municipal solid wastes.

Textbooks:

1. George Tchobanoglous, Frank Kreith, Handbook of Solid waste management, 2nd Edition, M/c Graw hill Education, 2002.
2. Municipal Solid Wastes (Management and Handling) Rules, 2000. Ministry of Environment and Forests Notification, New Delhi, 25th September, 2000. Amendment – 1357(E) – 08-04-2016.

References:

1. Biomedical Waste (Management and Handling) Rules, Ministry of Environment and Forests, Govt of India, New Delhi, 1998
2. Electronic Waste Management and Handling Rules, Ministry of Environment and Forests, Govt of India, New Delhi, 2011
3. CPHEEO, Municipal Solid waste management manual, Part II published under Swachh Bharat Mission, Ministry of Urban Development, GOI, 2016.

B.E CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Alternative Building Materials (3:0:0)3

(Effective from the academic year 2023-24)

Course Code	21CV542	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. Comprehend environmental issues due to building materials and the energy consumption in manufacturing building materials
2. Study the various masonry blocks, masonry mortar and structural behavior of masonry under compression.
3. Study the alternative building materials in the present context.
4. Comprehend the alternative building technologies which are followed in present construction field.

Module – 1

Introduction to Course: Issues in Global construction market and their role towards economy;

Introduction: Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Green concepts in buildings, Green building ratings – IGBC and LEED manuals – mandatory requirements, Rainwater harvesting & solar passive architecture. Environmental friendly and cost effective building technologies, Requirements for buildings of different climatic regions.

(8 hours)

Module – 2

Elements of Structural Masonry: Elements of Structural Masonry, Masonry materials, requirements of masonry units' characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, laterite Blocks, Fal- G blocks and Stabilized mud block. Manufacture of stabilized blocks.

Structural Masonry Mortars: Mortars, cementations materials, sand, natural & manufactured, types of mortars, classification of mortars as per BIS, characteristics and requirements of mortar, selection of mortar.

Uses of masonry, masonry bonding, Compressive strength of masonry elements, Factors affecting compressive strength, Strength of Prisms/wallets and walls, Effect of brick bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry, Design of masonry compression elements subjected to axial load.

(8 hours)

Module – 3

Alternate Building Materials: Lime, Pozzolana cements, Raw materials, Manufacturing process, Properties and uses. Fibers- metal and synthetic, Properties and applications. Fiber reinforced plastics, Matrix materials, Fibers organic and synthetic, Properties and applications. Building materials from agro and industrial wastes, Types of agro wastes, Types of industrial and mine wastes, Properties and applications. Masonry blocks using industrial wastes. Construction and demolition wastes.

(8 Hours)

Module – 4

Alternate Building Technologies: Use of arches in foundation, alternatives for wall constructions, composite masonry, confined masonry, cavity walls, rammed earth, Ferro cement and Ferro concrete building components, Materials and specifications, Properties, Construction methods, Applications.
Top down construction, Mivan Construction Technique.
Alternate Roofing Systems: Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes.

(8hours)

Module – 5

Equipment for Production of Alternate Materials: Machines for manufacture of concrete, Equipment's for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives.

(8 Hours)

Course outcomes:
The students will be able to:

CO1: Solve the problems of Environmental issues concerned to building materials and cost effective building technologies;

CO2: Prepare valuation reports of buildings. Select appropriate type of masonry unit and mortar for civil engineering constructions; also they are able to Design Structural Masonry Elements under Axial Compression.

CO3: Analyze different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of suggesting suitable agro and industrial wastes as a building material.

CO4: Recommend various types of alternative building materials and technologies and design an energy efficient building by considering local climatic condition and building material.

CO5: Perceive the recent technological developments in civil engineering.

Teaching Practice:

- Classroom teaching (chalk and Talk).
- Power Point Presentation.
- Using Information and Communication Technology (ICT).
- Audio and Video Visualization Tools.
- Industrial / Site Visit.

Textbooks:

1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, "Alternative Building Materials and Technologies", New Age International pub.
2. Arnold W Hendry, "Structural Masonry", Macmillan Publishers.

References:

1. RJS Spence and DJ Cook, "Building Materials in Developing Countries", Wiley pub.
2. LEED India, Green Building Rating System, IGBC pub.
3. IGBC Green Homes Rating System, CII pub.
4. Relevant IS Codes.

B.E CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

Advanced Concrete Technology (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	21CV543	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 concrete admixtures, Manufacture and requirement as per QCI-RMCPCS.
2. Know the various types of materials used to make concrete, their influence on strength and durability properties.
3. Understand causes of concrete deterioration, permeability of concrete, durability of concrete, alkali aggregation reaction.
4. Work on future advancement is concrete technology

Module – 1

Introduction to Course: Concrete Ingredients - Cement-Classification of cement-Testing of cement-Aggregates-Properties-Testing of aggregates as per Indian Standards-Quality of water.

Fresh Concrete and Admixtures: Workability-Factors affecting workability-Various workability tests-Admixtures-Chemical admixtures-Mineral admixtures.

RMC: Manufacture and requirement as per QCI-RMCPCS, properties, advantages and disadvantages.

(8 Hours)

Module – 2

Strength of Concrete: Mechanical properties of concrete-Compressive, Tensile, Flexural strength-Porosity-Gel/space ratio-Macro and Micro cracking-Aggregate-Cement ratio-Modulus of elasticity of concrete-Fatigue strength-Impact strength-Non-destructive testing methods.

Advanced testing: Non-destructive testing (NDT) techniques

(8 Hours)

Module – 3

Various stages of Concrete: Mixers-Various types of concrete mixers-Handling-Pumpable concrete-Placing of concrete-Compaction-Curing- Under water concreting-Curing.

Durability of Concrete: Permeability-Sulphate attack-Attack by sea water-Acid attack-Alkali-aggregate reaction-Freezing and thawing- Corrosion of reinforcement-Shrinkage-Plastic shrinkage-Drying shrinkage.

(8 Hours)

Module – 4

High Performance Concrete (HPC) - Introduction – Principles of HPC – Ingredients used for HPC – Production of HPC – Curing of HPC – Mechanism of HPC – Properties of HPC during the fresh and hardened state.

SEM & XRD: Microstructure analysis using scanning electron microscopy (SEM) and X-ray diffraction (XRD) - Mechanical and physical properties

(8 Hours)

Module – 5

Special Concretes: Self-Compacting Concrete - Introduction – Principles of SCC – Ingredients used for SCC – Mix design methods – Production and curing of SCC – Behavior of SCC under fresh and hardened state. Various Case Histories on HPC and SCC.

Emerging trends and future directions in concrete technology: 3D printing of concrete-Nanotechnology in concrete - Self-healing concrete - Smart and responsive concrete materials.

(8 Hours)

Course outcomes:

The students will be able to:

CO1: Identify the quality of cement and aggregates by various testing methods as per standards.

CO2: Evaluate the special concrete, workability and strength of concrete.

CO3: Know the various stages of concrete in concrete production.

CO4: characterize the mechanical and physical properties of concrete materials.

CO5: work of future development in concrete.

Teaching Practice:

- Classroom teaching (chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Text Books

1. Neville A. M., Brooks, J. J., Concrete Technology, 2017, Second Edition, Pearson, London, UK.References:
2. M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi.

Reference Books

1. Mehta P. K., Concrete: Microstructure, Properties and Materials, 2014, McGraw-Hill, New Delhi.
2. M L Gambir, “Concrete Technology”, McGraw Hill Education,2014.
3. N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81-8487-186-9
4. Job Thomas, “Concrete Technology”, CENGAGE Learning,2015.
5. IS 4926 (2003): Code of Practice Ready-Mixed Concrete [CED 2: Cement and Concrete] Criteria for RMC Production Control, Basic Level Certification for Production Control of Ready Mixed Concrete-BMTPC.

B.E CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Applications of Remote Sensing and GIS in Civil Engineering (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	21CV544	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) Comprehend the basic concepts of remote sensing.
2) Analyze satellite imagery and extract the required information
3) Extract the GIS data and prepare the thematic maps.
4) Use the thematic maps for various applications

Module – 1

Introduction: Relevance in the Global scenario. Financial bearing on the World Economy. Role in Environmental and Societal concerns. Internship and Job opportunities. Significance and application of the course in Civil Engineering.

Remote Sensing: Basic concept of Remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, and vegetation), Resolution, image registration and Image and False color composite, elements of visual interpretation techniques.

Applications: The above topic is required for concept of remote sensing.

(8 hours)

Module – 2

Remote Sensing Platforms and Sensors: Indian Satellites and Sensors characteristics, Remote Sensing Platforms, Sensors and Properties of Digital Data, Data Formats: Introduction, platforms IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. sensors, sensor resolutions (spatial, spectral, radiometric and temporal). Basics of digital image processing- introduction to digital data, systematic errors(Scan Skew, Mirror-Scan Velocity, Panoramic Distortion, Platform Velocity , Earth Rotation) and non-systematic [random] errors(Altitude, Attitude). Image enhancements (Gray Level Thresholding, level slicing, contrast stretching), image filtering.

Applications: The above topic is required for different platform and sensor in satellites

(8 hours)

Module – 3

Geographic Information System: Introduction to GIS; components of a GIS; Geographically Referenced Data, Spatial Data- Attribute data-Joining Spatial and attribute data, GIS Operations: Spatial Data Input – Attribute data Management, Geographic coordinate System, Datum; Map Projections: Types of Map Projections, Projected coordinate Systems. UTM Zones.

Applications: The above topic is required for processing satellite imageries.

(**8 hours)**

Module – 4

Data Models: Vector data model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape file; Relational Database, Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, and Data conversion.

Applications: The above topic is required for creating different thematic maps

Module – 5

Integrated Applications of Remote sensing and GIS: Applications in land use land cover analysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management. Location Based Services And Its Applications. Bhuvan website satellite imagery download and Google Earth integrating imageries.
Applications: The above topic is required for planning and implementation**.**

(8 hours)

Course outcomes:
The students will be able to:

CO1: Comprehend the various data collection and delineate various elements from the satellite imagery
CO2: Apply the knowledge of remote sensing in different features of ground information to create raster or vector data
CO3: Analysis of different thematic maps for various sectors.
CO4: Propose the latest technology to process satellite imageries.
CO5: Identify latest techniques and trends in GIS and cost effective aspects for analyzing Satellite data.

Teaching Practice:

- Classroom teaching (chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Textbooks

1. Narayan Panigrahi, "Geographical Information Science", and ISBN 10: 8173716285 / ISBN 13:9788173716287, University Press2008.
2. Basudeb Bhatta, "Remote sensing and GIS" , ISBN:9780198072393, Oxford University Press2011
3. Kang – T surg Chang, "Introduction to Geographic Information System". Tata McGraw Hill Education Private Limited2015.
4. Lilles and, Kiefer, Chipman,"RemoteSensingandImageInterpretation",Wiley2011.

References

1. 1. Chor Pang Lo and Albert K.W Yeung, "Concepts &Techniques of GIS", PHI,2006
2. John R. Jensen, "Remote sensing of the environment", an earth resources perspective– 2nd edition– by Pearson Education2007.
3. Anji Reddy M., "Remote sensing and Geographical information system", B. S. Publications2008.
4. Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, "Principals of Geo physical Information system", Oxford Publications2004.
5. S Kumar,"Basics of remote sensing & GIS", Laxmi publications 2005

B.E CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - VI

Sustainability Concepts in Civil Engineering (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	21CV545	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 about the principles, indicators and general concept of sustainability.
2. Apprehend the local, regional and global impacts of unsustainable designs, products and processes.
3. Student shall be able to apply the sustainability concepts in engineering
4. Know built environment frame work sand their use
5. Understand how building and design is judged and valued by clients and stakeholders and how to implement sustainability

Module – 1

Introduction: Sustainability - Introduction, Need and concept of sustainability, Social environmental and economic sustainability c o n c e p t s . Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India Water Act, Air Act

(8 hours)

Module – 2

Global Environmental Issue: Resource degradation, Climate change, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon footprint Carbon sequestration – Carbon capture and storage (CCS). Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking.

(8 hours)

Module – 3

Sustainable Design: Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport.

(8 hours)

Module – 4

Clean Technology and Energy: Energy sources: Basic concepts-Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. Rainwater harvesting.

(8 hours)

Module – 5

Green Engineering: Green Engineering concepts, Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis**.**

(8 hours)

Course outcomes:

The students will be able to:

CO1- Learn the sustainability concepts; understand the role and responsibility of engineers in sustainable development.

CO-2 Quantify sustainability, and resource availability, Rationalize the sustainability based on scientific merits.

CO-3 Understand and apply sustainability concepts in construction practices, designs, product developments and processes across various engineering disciplines.

CO-4 Make a decision in applying green engineering concepts and become a lifelong advocate of sustainability in society.

Teaching Practice:

- Classroom teaching (chalk and Talk)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Textbooks

1. 1. Allen, D.T. and S honnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. 2. Bradley. A.S; Adebayo, A. O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

References

1. Mackenthun, K. M.,Basic Concepts in Environmental Management, Lewis Publication.
2. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications Rating System, TERI Publications - GRIHA Rating System.
3. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
4. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
5. Malcolm Dowden, Climate Change and Sustainable Development: Law, Policy and Practice.
6. Daniel A. Vallero and Chris Brasier, “Sustainable Design: The Science of Sustainability and Green Engineering”, Wiley-Blackwell.
7. Sustainable Engineering Practice: An Introduction, Committee on Sustainability, American Society of Civil Engineers.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Soil Mechanics and Foundation Engineering (2:1:0) 3

(Effective from the academic year 2023-24)

Course Code	21CV55	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

1. Develop an appreciation soil as a vital construction material, and of soil mechanics in the engineering of civil infrastructure.
2. Develop an understanding of the relationships between physical characteristics and mechanical properties of soils.
3. Understand and experience experimental measurement of the physical and mechanical soil properties commonly used in engineering practice.
4. Understand and be able to apply the modeling and analysis techniques used in soil mechanics: (a) Darcy's Law and flow-nets for seepage; (b) consolidation models for load-time-deformation responses of soils; (c) Mohr-Coulomb models for shear strength behavior of soils.

Module – 1

Introduction to Soil Mechanics: Soil problems in civil engineering, application of geotechnical engineering in prediction, presentation and mitigation of natural and manmade hazards, demand for geotechnical engineers in projects across the globe.

Phase relationship: A preview of soil behavior, origin and formation of soil ,3 Phase Diagram-Description of assemblage of soil particle and individual soil particle, Weight-Volume relationships and related applications - Weight-Volume relationships and related numerical

Index properties of soil and their determination: Index properties of soil and their determination, Various index properties and their laboratory determination, Water content, Specific Gravity, Particle size distribution, Relative density, Consistency limits and their indices, in-situ density, Activity of Clay, Thixotropy of clay, IS classification, Plasticity chart and its importance

(8 Hours)

Module – 2

Soil exploration and sampling: Objectives of exploration program, Methods of exploration: Trial pits, boring. Number and depth of borings for building and dams, Types of samples, undisturbed, disturbed and representative samples. Types of Samplers, Sample disturbance, Area ratio, Recovery ratio, Standard penetration test

Compaction: Introduction to soil compaction, standard and modified proctor test, factors effecting compaction of soil, improvement in soil by compaction, field compaction method with real time example.

Flow of water through soil: Darcy's law, factors effecting permeability of soil, determination of permeability coefficient for fine- and coarse-grained soil, determination of permeability in field seepage.

(8 Hours)

Module – 3

State of stress in soil Failure theory: Effective Stress, Effective stress concept, Total pressure and Pore pressure, effect of water table, Numerical problems. Shear strength of clay and sand, Mohr-Coulomb failure theory shear strength, Direct shear, Triaxial compression, Unconfined Compressive Strength and Vane shear tests, Skemtpon's Pore pressure parameters, Factors influencing shear strength of soil

Consolidation of soil: Consolidation of soil - Introduction to Consolidation, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations. Consolidation characteristics of soil (Cc, av, mv and cv), Time rate of consolidation, Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method, computing the time-dependent settlement of a soil deposit after a given load is applied to it.

(8 Hours)

Module – 4

Stress induced by applied loads: Stresses due to point load, line load, strip load, uniformly loaded circular area, and rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence Chart. Settlement computation from elastic theory using a real-time example in urban area.

Slope stability: Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, Wedge failure Swedish circle method, friction circle method, stability numbers and charts.

(8 Hours)

Module – 5

Earth pressure theories and retaining wall: Earth pressure at rest-active and passive, Rankine's and Coulumb's theory for cohesive and cohesionless soil, compute the magnitude of loads that can be applied to an earthen system without generating shear failure in the soil. Rehbann's and Cullmans'graphical method.

Shallow foundation: Basic definitions, Terzaghi's bearing capacity theory, Types of failure determination of bearing capacity by Terzaghi's Bearing Capacity Theory, Skempton's Analysis for Cohesive soils and IS code method, Plate load test Settlement calculation.

Recap/Summary of the Course

(8 Hours)

Course Outcomes:

The students will be able to:

CO1: Discuss the concepts of mechanics to perceive the nature of soil, its fundamental behavior and classification, behavior of natural slope, stresses in soil, foundations and retaining wall by conducting ground investigation studies.

CO2: Apply the conceptual knowledge to estimate the soil behavior.

CO3: Examine the recent trends in geotechnical engineering.

CO4: Propose a solution for problematic soil for the given site condition.

CO5: Evaluate the latest techniques and developments in geotechnical engineering.

Textbooks:

1. Das, Braja M., "Principles of Geotechnical Engineering", 7th Edition, Boston: PWS, 2010. Print.
2. Murthy, V N. S., "Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering", 10th Edition, New York: Marcel Dekker, 2003. Print.
3. Ranjan, Gopal, and A. S. R. Rao., "Basic and applied soil mechanics", 2nd Edition New Age International, 2007.

4. Das, Braja M., and Nagaratnam Sivakugan., “Introduction to Geotechnical Engineering”, 2nd Edition Cengage Learning, 2016.

References:

1. Lambe, T. William, and Robert V. Whitman., “Soil mechanics”, Vol. 10. John Wiley & Sons, 2008.
2. Holtz, Robert D., William D. Kovacs, and Thomas C. Sheahan., “An introduction to geotechnical engineering”, 2nd Edition Englewood Cliffs, NJ: Prentice-Hall, 2011.
3. Craig, Robert F., “Craig's Soil Mechanics”, 7th Edition, CRC press, 2004.
4. Karl, Terzaghi. "Soil Mechanics in Engineering Practice”, 3rd Edition, Peck, Gholamreza Mesri. New York 664 (1996).
5. Bowles, Joseph E. “Foundation analysis and design” (1988).

B.E CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Design of RCC and Steel Structural Elements (2:1:0) 3

(Effective from the academic year 2023-24)

Course Code	21CV56	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:2:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

1. Comprehend knowledge on IS codes for RCC and Steel Structural elements.
2. Provide knowledge in analysis and design of RCC elements subjected to flexure and shear
3. Understand a procedural knowledge in designing of RCC compression members
4. Impart knowledge on design of connections and tension members
5. Furnish knowledge on design of steel compression members and flexural members

Module – 1

Introduction to R.C.C. Structural Elements:

Reinforced Cement Concrete Elements- Introduction and Applications- Limit State Design Concept, Partial safety factors, load factors, stress-strain relationship, stress block parameters, failure criteria, Use of I.S. 456-2000, Limit state of Collapse in flexure, shear, torsion and compression- Limit state of Serviceability.

Introduction to Steel Structural Elements:

Advantages and Disadvantages of Steel Structures, Limit state method Limit State of Strength, Structural Stability, Serviceability Limit states, Failure Criteria of steel, Design Consideration, Loading and load combinations, IS code provisions, Specification and Section classification.

(6 Hours)

Module – 2

Limit State Collapse in Flexure and Shear:

Analysis and Design of Singly and Doubly Reinforced Beams; Design of One-Way single Span Slabs, and Two-Way Slabs with various end conditions using IS Code Coefficients; Introduction to staircase- Design of Dog Legged Staircase.

(10 Hours)

Module – 3

Limit State of Collapse Under Compression:

Axially loaded Short and Long Column, Column with Axial Load, Uniaxial and Biaxial Moment, Interaction diagram / Charts. Isolated footing for Axially Loaded Columns, Uniaxial Bending, Combined Footing- Rectangular Footing and Strap beam.

(8 Hours)

Module – 4

Design of Connections:

Introduction, Types of Bolts & Welds, Advantages and Disadvantages of Bolted and Welded Connections. Design of High Strength friction Grip (HSFG) bolts, Strength of bolt and strength of weld, Efficiency of joints, Design of Simple bolted Connections (Lap and Butt joints); Design of Simple welded joints for truss member

Design of Tension Members:

Introduction, Types of Tension members, Modes of Failure, Factors affecting the strength of tension members, Design of Tension members and Lug angles.

(8 Hours)

Module – 5

Design of Compression Members:

Introduction, Failure modes, Behavior of compression members, Sections used for compression members, Effective length of compression members, Slenderness ratio, Design of compression members and built up Compression members, Design of Laced and Battened Systems.

Design of Beams:

Introduction, Beam types, Lateral Stability of beams, factors affecting lateral stability, Behavior of Beams in Bending, Design strength of laterally supported beams in Bending, Design of Laterally Unsupported Beams [No Numerical Problems]. **(8 Hours)**

Course outcomes:

The students will be able to:

CO1: Explain the design philosophies of R.C.C. and steel structural elements.

CO2: Analyse and design RCC structural elements subjected to flexure and shear.

CO3: Design RCC structural elements subjected to compression.

CO4: Design bolted & welded connections, and steel structural members subjected to tension.

CO5: Design steel structural members subjected to compression, and flexure.

Teaching Practice:

- Classroom teaching (Chalk and Black Board)
- ICT – Power Point Presentation
- Audio & Video Visualization Tools

Text Books;

1. Varghese P.C.; Limit state design of Reinforced Concrete Structures Prentice Hall of India, 2008.
2. S. U. Pillai, D.Menon: Reinforced Concrete Design, Tata Mcgraw-Hill Publishing Company New Delhi 2017.
3. Subramanian. N., "Design of Steel Structures: Limit State Method", Oxford University Press, New Delhi, 2018.
4. Duggal. S.K., "Limit State Design of Steel Structures", 3rd Edition, Tata McGraw Hill Publishing Company, 2019.

References:

1. IS: 456:2000, Indian Standard Code for Plain and reinforced concrete-code of practice, 4th Revision, BIS, New Delhi, 2000.
2. IS 800-2007: General Construction in Steel Code Practice. Bureau of Indian Standards, Third Revision, New Delhi.
3. S.P. (16): Design Aids for Reinforced Concrete. (Interaction Charts Only) Bureau of Indian Standards 1980.
4. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons, Inc.1975
5. Shiyekar. M.R., "Limit State Design in Structural Steel", 2nd Edition, Prentice Hall of India Pvt. Ltd., 2017.
6. Bhavikatti. S.S., "Design of Steel Structures by Limit State Method as per IS:800- 2007", IK International Publishing House Pvt. Ltd., 2013.
7. Negi, B.S. "Design of Steel Structures", Tata McGraw Hill India, 2017.

B.E CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Highway Engineering (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	21CV57	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 different modes of transportation systems, history, development of highways and the organizations associated with research and development of the same in INDIA.
2. Understand Highway planning and development considering the essential criteria's (engineering and financial aspects, regulations and policies, socio economic impact).
3. Get insight to different aspects of geometric elements and train them to design geometric elements of a highway network.
4. Understand pavement and its components, pavement construction activities and its requirements.
5. Gain the skills of evaluating the highway economics by B/C, NPV, IRR methods and also introduce the students to highway financing concepts.

Module – 1

Introduction to Course: Relevance in the Global scenario. Financial bearing on the World Economy. Role in Environmental and Societal concerns. Internship and Job opportunities in private, Government and central government. Significance and application of the course in Civil Engineering.

Role of Transportation Engineering-Characteristics of Road Transport–scope of highway engineering.

Highway Planning: Necessity of highway planning- Classification of Roads-road Patterns-Planning Surveys- interpretation of Plans-Preparation of Master plans- Phasing of plan-Lucknow Road Development Plan-Road Network for 2021- Problems.

(8 Hours)

Module – 2

Highway Alignment and Surveys: Alignment-Surveys for highway location- Reports-Highway Projects- Realignment and new alignment.

Geometric Design: design Factors-Highway cross sectional elements-pavement surface Characteristics-Camber-Sight distance requirement- Horizontal alignment design speed-super elevation-transition curves-set back distance- vertical alignment – gradients-curves-problems on above.

(8 Hours)

Module – 3

Highway Materials and Pavement Design: desirable properties of sub grade soil- Soil Classification – IS – HRB methods- Plate load test and CBR Test- Problems - Road aggregates - Desirable properties - Tests - Bituminous materials- Desirable Properties-Tests.

(8 Hours)

Module – 4

Pavement design – Flexible and Rigid pavements- Design of flexible pavement by CBR Method (CSA) - Design of Rigid pavements- wheel load stresses- Westergaard equations- Temperature stresses- problems on above. Introduction to kenpave software.

(8 Hours)

Module – 5

Highway Drainage: objects-surface drainage- -design of surface drainage system- Subsurface drainage-lowering of water table-control of seepage flowcontrol of capillary rise-road construction in waterlogged areas.

Traffic Surveys and Traffic forecasting: classified traffic volume, growth rate, projected traffic for assessing road way requirements, origin- destination characteristics and studies.

Recap/Summary of the Course.

(8 Hours)

Course outcomes: The students will be able to:

CO1: Discuss the various component's in Highway Engineering.
CO2: Apply the conceptual knowledge to design the various components in highway Engineering.
CO3: Propose solution for real- time scenario in highway Engineering.
CO4: Evaluate the latest developments in highway Engineering.
CO5: Identify latest techniques and development in highway Engineering.

Textbooks:

1. Khanna, S.K. and Justo,C.E.G., " Highway Engineering" 10th Edition, Nem Chand & Bros, 2015.
2. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013.
3. K.P.subramanium, "Transportation Engineering", SciTech Publications, Chennai.

References:

1. Fred L. Mannering, Scott S. Washburn and Walter P. Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011.
2. S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing Laboratory Manual", Nem Chand Bros, Roorkee.
3. IRC-37–2012, The Indian Roads Congress, Guidelines for the Design of Flexible Pavements, New Delhi.
4. IRC 58-2012. The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways, New Delhi.

B.E. CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Environmental Engineering Laboratory (0:0:1)1

(Effective from the academic year 2023-24)

Course Code	21CVL58A	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

1. Identify the environmental significance of various parameters and application in environmental engineering practice.
2. Demonstrate the process of water & wastewater quality testing.
3. Compare the concentrations various parameters of water and wastewater.
4. Propose the degree and type of treatment to be given to a water or wastewater before disposal.

List of Regular Experiments

Introduction to the course: Relevance in the Global scenario. Financial bearing on the World Economy. Role in Environmental and Societal concerns. Job opportunities as consultant or engineer.

PART- A

Determination of Alkalinity for a sample of water & wastewater.

Determination of pH for a sample of water & wastewater.

Determination of Total, Permanent and Temporary hardness for a sample of water.

Determination of Dissolved Oxygen for a sample of water.

Determination of Turbidity for a sample of water & wastewater.

Determination of percentage of available chlorine in bleaching powder.

Determination of Chlorine Demand for a sample of drinking water source.

Determination of Chloride concentration for a sample of water & wastewater.

PART- B

Determination of Acidity for a sample of water & wastewater.

Determination of Electrical Conductivity for a sample of water & wastewater.

Determination of Total, Calcium & Magnesium Hardness for a sample of water.

Determination of BOD for a polluted source of water.

Determination of iron for a sample of water.

Determination of Residual Chlorine for a sample of portable water.

Determination of Optimum Dosage of Alum using Jar test apparatus.

Determination of Solids in Sewage:

a) Total Solids,
b) Suspended Solids,
c) Dissolved Solids,
d) Volatile Solids, Fixed Solids,
e) Settleable Solids.

List of Demonstration Experiments
Determination of sound by Noise Dosimeter at different locations inside buildings or outdoors
Determination of light intensity in different locations inside buildings or outdoors
Determination of ambient indoor & outdoor temperatures
Determination of ambient SPM 2.5 and SPM 10
Monitoring of Gases and Particulates in Ambient Air
Site Visit/ Industrial Visit: Stack monitoring/Municipal STP.
Open Ended Experiments
• Determination of suitability of near-by surface water source for various uses.
• Determination of reliability of house/hostel water for drinking purposes.
• Determination of compliance of noise levels across various land-use patterns.
• Determination of influence of climatic variables upon air pollution levels.
Summary of the Course
Course Outcomes: The students will be able to:
CO1: Analyze for type of physical, chemical and biological treatment to be given to a water source and wastewater stream. CO2: Interpret the experimental outcome with respect to environmental significance. CO3: Work individually and in a team to Develop report for presence of pollutants due to point and non-point sources. CO4: Formulate choice of experiments for a given real-time scenario.
Examination pattern: • **SEE** will be conducted for 3 hours. • **Two** experiments, one from **Part A** and one from **Part B** has to be completed. • Questions for Part A and Part B is given on a lotto basis and oral viva-voce is conducted. • In **Record** and in **CIE**, for each experiment the weightage of marks is as follows, (i) Aim, Procedure and writeup- 15% marks (ii) Conducting the practical including calculation, graphs and results – 70% marks (iii) Viva- Voce- 15% marks Note: • In CIE and SEE, if there is change of experiment then subsequently 15% marks with respect to aim, write up and procedure shall be deducted. • CIE can have the similar QP pattern as SEE and shall be accordingly evaluated.
References: 1. Howard S. Peavy, Donald R. Rowe, George T., Environmental Engineering, McGraw Hill, International Edition, New York, 2000. 2. Metcalf & Eddy, Waste Water Engineering: Treatment & Reuse, 4th Edition, McGraw Hill Education, 2003. 3. CPHEEO, Manual on Water Supply and Treatment", Ministry of Urban Development, New Delhi, 1999. 4. APHA, Standard Methods for the Examination of Water and Wastewater, 21st Edn. American Public Health Association, Washington DC, 2005. 5. CPHEEO, Municipal Solid waste management manual, Part II published under Swachh Bharat Mission, Ministry of Urban Development, GOI, 2016. 6. http://vlabs.iitb.ac.in/vlabs-dev/labs/nitk_labs/Environmental_Engineering_1/index.html 7. CPCB (2011), Guidelines for the Measurement of Ambient Air Pollutants, Volume-1, Delhi.

8. IS 5182 (part 23), 2006, Indian standards – Methods for measurement of air pollution, Part-23 – Respirable suspended particulate matter (PM10), cyclonic technique.
GRIMM, environmental dust monitor (model 1.107) manual.
9. IS 5182 (Part 14)-2000 (reaffirmed 2005) : Indian standards, Method of measurement of air pollution: Guidelines for planning the sampling for atmosphere.
10. Rao, M.N., and Rao, H.V.N., Air pollution. Tata McGraw-Hill Publishing Co. Ltd., New Delhi 1989.

B.E CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Software Application Laboratory (0:0:1) 1

(Effective from the academic year 2023-24)

Course Code	21CVL58B	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

1. Use industry standard software in a professional set up.
2. Understand the elements of finite element modelling, specification of loads and boundary condition, performing.
3. Analysis and interpretation of results for final design.

List of Experiments

PART A

Introduction to Course: Relevance in the Global scenario. Financial bearing on the World Economy. Internship and Job opportunities. Significance and application of the course in Civil Engineering.

Use of design software tools STAAD PRO or ETABS for:

1. Analysis and design of plane trusses, continuous beams, portal frames
2. 3D analysis of multi-storied frame structures
3. Work in team to complete the design of the project in the stipulated time using STAAD PRO or ETABS

Use of EXCEL spread sheets:

Design of singly reinforced and doubly reinforced rectangular beams, design of one way and two way slabs, computation of earthwork, Design of horizontal curve by offset method, Design of super elevation

PART B

Project Management-

1. Exercise on Project planning and scheduling of a building project using any project management software:
2. Understanding basic features of Project management software
3. Constructing Project: create WBS, Activities, and tasks and Computation Time using Excel spread sheet and transferring the same to Project management software.
4. Identification of Predecessor and Successor activities with constrain.
5. Constructing Network diagram (AON Diagram) and analyzing for Critical path, Critical activities and Other non-Critical paths, Project duration, Floats.
6. Study on various View options available
7. Basic understanding about Resource Creation and allocation
8. Understanding about Splitting the activity, Linking multiple activity,
9. assigning Constrains, Merging Multiple projects, Creating Baseline Project

GIS applications using open source software:

a. To create shape files for point, line and polygon features with a map as reference.

b. To create decision maps for specific purpose.

Course outcomes:

The students will be able to:

CO1: Use software skills in a professional set up to automate the work and thereby reduce cycle time for completion of the work.

Examination pattern:

- **SEE** will be conducted for 3 hours.
- **Two** experiments, one from **Part A** and one from **Part B** has to be completed.
- Questions for Part A and Part B is given on a lotto basis and oral viva-voce is conducted.
- In **Record** and in **CIE**, for each experiment the weightage of marks is as follows,

(i) Aim, Procedure and writeup- 15% marks

(ii) Conducting the practical including calculation, graphs and results – 70% marks

(iii) Viva- Voce- 15% marks

Note:

- In CIE and SEE, if there is change of experiment then subsequently 15% marks with respect to aim, write up and procedure shall be deducted.
- CIE can have the similar QP pattern as SEE and shall be accordingly evaluated.

Textbooks:

- M. Vignesh Kumar, "Structural Modeling, Analysis & Design Using Staad Pro Software", 2018, Lambert Publisher

References:

- K K Chitkara," Construction Project Management", 2nd Revision, Tata McGraw Hill Publishing co. Ltd

B.E CIVIL ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Concrete Technology Laboratory (0:0:1) 1

(Program Core from the academic year 2023-24)

Course Code	21CVL58C	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	03

Course Objectives:

This course will enable students to:

1. To prepare the students to effectively link theory with practice and application and to demonstrate background of the theoretical aspects.
2. To prepare the students to solve problems including design elements and related to their course work
3. Gain knowledge on testing of Self compacting concrete as per EFNARC norms
4. To prepare the students to effectively link theory with practice and application and to demonstrate background of the theoretical aspects.

Part – A Fresh Concrete Properties

1. **Conventional Concrete Mix Design** as per IS: 10262-2019 and Marsh Cone test - Admixture Dosage Determination.
2. Slump cone test.
3. Compaction Factor test (Vee-Bee).
4. Flow Table test.
5. Vee Bee Test
6. **Self- Compacting Concrete** Mix Design as per EFNARC Guidelines
7. Slump Cone test
8. L-Box test
9. J-Ring test
10. V Funnel test

Part – B Tests on Harden Concrete

1. Compressive strength.
2. Split Tensile Strength test.
3. Flexural Strength test.
4. Determination of Young's Modulus.
5. Non- Destructive Testing:

- Rebound Hammer
- Ultra-sonic Pulse Velocity (UPV)

Open-end Experiment

1. Mix design procedure for SCC.

2. Pervious Concrete:

1. Design of pervious concrete,
2. Compressive strength test.

Course outcomes:

The students will be able to:

CO1: Test the building materials and interpret the results as per code recommendations.

CO2: Test the ingredients of concrete and their interpretation of results as per codal recommendations

CO3: Write a report on the suitability of materials as per code provisions.
CO4: Test the ingredients of concrete and their interpretation of results as per code recommendations.
CO5: Design a suitable concrete mix as per code provisions.

Examination pattern:

- **SEE** will be conducted for 3 hours.
- **Two** experiments, one from **Part A** and one from **Part B** has to be completed.
- Questions for Part A and Part B is given on a lotto basis and oral viva-voce is conducted.
- In **Record** and in **CIE**, for each experiment the weightage of marks is as follows,

(i) Aim, Procedure and writeup- 15% marks
(ii) Conducting the practical including calculation, graphs and results – 70% marks
(iii) Viva- Voce- 15% marks

Note:

- In CIE and SEE, if there is change of experiment then subsequently 15% marks with respect to aim, write up and procedure shall be deducted.

CIE can have the similar QP pattern as SEE and shall be accordingly evaluated.

Textbooks:

1. Kukreja, Material testing lab manual, Standard Publishers,4th edition, 2010.
2. Hemant Sood, Lab manual on Testing of engineering materials, New age international,2nd edition, 2015.
3. Abdul Mubeen, Experimental Strength of materials, Khanna publishers 3rd edition, 1993.
4. N Subramanian, Building Materials Testing and sustainability, Oxford Publications, 1st Edition2019.
5. Gambhir, Concrete lab manual, Dhanpat Rai & Sons, 3rd edition,2017
6. MS Shetty, Concrete technology, S Chand Publications,2nd edition, 2011
7. Khanna & Justo, Highway Materials Testing Laboratory manual, Nemchand Bros 2nd edition, 2011
8. L R Kadiyali, Highway Engineering Khanna publishers2018, 10th edition
9. EFNARC. Guidelines for self-compacting concrete. February 2002.

References:

1. Chinmaya Mohapatra, Mechanical Testing of Metallic Materials Create space Independent Publishing2nd edition, 2016.
2. Kazimi S.M.A, Solid Mechanics, Tata McGraw-Hill Publishing Co., New Delhi. 3rd edition 2019.
3. Srinath, L.S Advanced mechanics and solids Tata McGraw Hill Education Pvt. Ltd., New Delhi4th edition 2010.
4. Punmia B.C. Theory of Structures(SMTS) Vol 1& II Laxmi Publishing Pvt Ltd, New Delhi 5th edition, 2016.
5. Rattan. S.S, Strength of Materials Tata McGraw Hill Education Pvt. Ltd., New Delhi,2nd edition, 2013.
6. IS 2386-Part 1 to Part 16, BIS New delhi,2010
7. IS 10262-2019, BIS New Delhi,2019
8. IS 456-2000, BIS New Delhi,2010
9. IS 383-2016, BIS New Delhi,2016