CONSTRUCTION MANAGEMENT AND ENTREPRENEURSHIP			
Course Code	**24CV51**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Basic Construction Activities.
- Basics on Concept of Management.
- Understanding of streamline of Construction activities to plan and schedule them accordingly.
- Problem-Solving Skills

Course Objectives:

- To understand the concept of Scheduling and cost management in construction project
- To go through the Statutory and regulatory requirements in construction
- To explain the concept of procurement and contract management
- To understand Quality and Safety during construction.
- To identify the risks and its management.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **8 Hours**

Planning and Scheduling Construction project formulation – construction management, define scope – scope management, types of project planning and its management, Statutory and regulatory requirements- layout and building plan approval, contract, Fire and Safety, Quality, Environmental, commencement certificate, legal and public policies. Schedule management – WBS, Bar Charts, Sequencing and Dependency, Network Diagram, Activity Duration, Critical Path Method, PERT, Case study. Cost Management - Creating schedules, Assigning Resources, Cost, Evaluation, Optimization and Tracking.

Text Book: Chapter-1:1.2,1.3 Chapter-2: 2.6 Chapter-4: 4.1 to 4.5

Module-2 **8 Hours**

Resource Management

Basic concepts of resource management, class of lab our, Wages & statutory requirement, Labour Production rate or Productivity, Factors affecting labour output or productivity.

Construction Equipment: classification of construction equipment, estimation of productivity for:

excavator, dozer, compactors, graders and dumpers. Estimation of ownership cost, operational and maintenance cost of construction equipment. Selection of construction equipment and basic concept on equipment maintenance

Materials: material management functions, inventory management.

Text Book: Chapter-9: 9.1 to 9.7

Module-3 **8 Hours**

Contract and Procurement management Procurement – procurement types, planning, stages – procurement execution – sustainable procurement management Construction contract –formation, types, essential elements, contract law – tendering process- contract award – Documentation – contractor and sub-contractor management –claims – disputes- compensation – breach of contract – project completion and project closure.

Text Book: Chapter-8: 8.1

Module-4 **8 Hours**

Quality and Risk Management Management – Quality Management System – Chart and tools. Safety management - Risk management - Process, Terminology, Identification, Analysis and Response Strategy.

Introduction to Engineering Economy - Interest and Interest Factors: Interest rate, Simple interest, Compound interest, Cash- flow diagrams, Exercises and Discussion. Comparison of alternatives: Present worth, annual equivalent, capitalized and rate of return methods, Minimum Cost analysis and break even analysis.

Text Book: Chapter-14: 14.1 to 14.3, Chapter-14: 15.1 to 15.3

Module-5 **8 Hours**

Introduction to Entrepreneurship – Characteristics of a Successful Entrepreneur, Understand the entrepreneurial journey, different entrepreneurial styles, personality traits, strengths, and weaknesses.5M Model, Communication skills: communication breakdown- miscommunication and poorlistening,rectification.

Business Planning Process: Business planning process, marketing plan, financial plan, project report and feasibility study, guidelines for preparation of model project report for starting a new venture. Introduction to international entrepreneurship opportunities, entry into international business, exporting, direct foreign investment, venture capital.

Text Book Chapter-6: 6.1, 6.2 Chapter 8: 8.1 to 8.3

Course outcomes (Course Skill Set):

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

CO1: Develop WBS and estimate the resource requirements. (PO – 1 PSO – 1,2)

CO2: Analyze the cost control monitoring and accounting methods for a project. (PO – 1,11, PSO – 1,2)

CO3: Understand the Statutory and legal requirements for a construction.(PO–1,11, PSO – 1,2)

CO4: Evaluate alternatives and develop capital budget for different scenarios.

Prepare the plan for procurement management and Risk mitigation. (PO – 1,11, PSO – 1,2)

CO5: Understand the concept of entrepreneurship and business planning. (PO – 1,11 PSO – 1,2)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Textbook:

1. Chitkara, K.K, "Construction Project Management: Planning Scheduling and Control", Tata McGraw Hill Publishing Company, New Delhi.

Reference Books:

1. Dr. U.K. Shrivastava "Construction Planning and Management", Galgotia Publications Pvt. Ltd. New Delhi.
2. Engineering Economics, R Panneerselvam, Eastern Economy Edition 2001, PHI, ISBN – 81- 203-1743-2.

3. Cost Accounting, Khan M Y, 2nd Edition, 2000, Tata McGraw-Hill, ISBN 0070402248
4. Mechanical Estimating & Costing, T.R.Banga, S.C.Sharma, 16th Edition, 2011, Khanna Publishers, ISBN8174091009
5. Poornima M. Charantimath, "Entrepreneurship Development and Small Business Enterprise", DorlingKindersley (India) Pvt. Ltd., Licensees of Pearson education.

Web links and Video Lectures(e-Resources):

- https://www.youtube.com/watch?v=vUMGvpsb8dc
- https://www.youtube.com/watch?v=J1WwNKDdDC0
- https://www.youtube.com/watch?v=2gmCr40uT4U
- https://www.youtube.com/watch?v=EswUCrmaVN0
- https://www.youtube.com/watch?v=LEfBpGh1dnU
- https://www.youtube.com/watch?v=hzCa6fA4mfo
- https://www.youtube.com/watch?v=iZgTT50_xug
- https://www.youtube.com/watch?v=WSj4f_yqLy4
- https://www.youtube.com/watch?v=b_n6i1ug0tQ
- https://www.youtube.com/watch?v=DxWDtTIWdkE

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
  - Case Study
  - Gate Based Questions solving
  - MOOC Assignment for selected Module

CONCRETE TECHNOLOGY			
Course Code	**24CV52**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	04	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on:

- Basic knowledge of Building Materials
- Engineering Chemistry
- Fundamentals of Strength of Materials
- Basic concepts of construction practices related to concrete

Course objectives:

- To recognize material characterization of ingredients of concrete and its influence on properties of concrete
- To study the properties of fresh concrete and hardened concrete
- Proportion ingredients of Concrete to arrive at most desirable mechanical properties of Concrete.
- Ascertain various types of special concrete with their properties.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Blackboard teaching
2. Power point Presentation
3. Videos, NPTEL materials
4. Quiz/Assignments/Open book test to develop skills.
5. Adopt problem-based learning (PBL) to develop analytical and thinking skills.
6. . Encourage collaborative learning, site visits related to subject and impart practical knowledge.

Module-1	8 hrs

Concrete Ingredients

Cement manufacturing process, chemical composition and their importance, hydration of cement, types of cement. Testing of cement, steps to reduce carbon footprint.

Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction, and manufacturing.

Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, requirement. Recycled aggregates Water – qualities of water.

Chemical admixtures – plasticizers, accelerators, retarders, and air entraining agents. Mineral admixtures – Pozzolanic and cementitious materials, Fly ash, GGBS, silica fumes, Metakaolin and rice husk ash. **L1, L2**

Text Book-1: Chapter 1,2,3,4,5

Module-2	8 hrs

Fresh Concrete

Factors affecting workability. Measurement of workability–slump, Compaction factor and Vee- Bee Consistometer tests, flow tests. Segregation and bleeding. Process of manufacturing of concrete- Batching, Mixing, Transporting, Placing and Compaction. Curing – Methods of curing – Water curing, membrane curing, steam curing, accelerated curing, self- curing. Good and Bad practices of making and using fresh concrete and Effect of heat of hydration during mass concreting at project sites**.**

L1, **L2**

Text Book--1: Chapter 6: 6.1 to 6.8

Module-3	8 hrs

Hardened Concrete

Factors influencing strength, W/C ratio, gel/space ratio, Maturity concept, testing of hardened concrete, Creep factors affecting creep. Shrinkage of concrete – plastic shrinking and drying shrinkage, Factors affecting shrinkage. Testing of Hardened Concrete: Compression tests – Tension tests– Flexure tests – Splitting tests

Durability

significance of durability. Internal and external factors influencing durability, Mechanisms- Sulphate attack – chloride attack, carbonation, freezing and thawing. Corrosion, Durability requirements as per IS-456.

In situ testing of concrete- Penetration and pull-out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications and limitations.

L1, L2

Text Book-1: Chapter 7.1-7.9, 8.1-8.3, 9.1-9.9

Module-4	8 hrs

Concrete Mix Design

Principles of concrete mix design, Parameters and factors influencing mix design, Concept of Mix Design with and without admixtures, variables in proportioning and Exposure conditions, Selection criteria of ingredients used for mix design, Procedure of mix proportioning. Numerical Examples of Mix Proportioning using IS 10262:2019**.**

L1, L2, L3

Text Book-1**:** Chapter 11: 11.1- 11.13

Module-5	8 hrs

Special Concretes

RMC-manufacture and requirement as per QCI-RMCPCS, properties, advantages, and disadvantages. Self- Compacting concrete- concept, materials, tests, properties, application and typical mix Fiber reinforced concrete - types of fibres, properties, application of FRC.
Light weight concrete-material properties and types. Typical light weight concrete mix proportion and applications, materials, requirements,
High Strength Concrete and High-Performance Concrete. Polymer concrete, SIFCON Geo polymer Concrete
.

L1, L2, L3

Text Book-1**:** Chapter 12,13: 12.1-12.13,12.,13.1-13.11

Course outcomes (Course Skill Set):

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

CO1: Explain the properties of the constituent materials of concrete. (PO – 1,2,3,6 PSO – 1,2)
CO2: Distinguish concrete behaviour based on its fresh and hardened properties. (PO – 1,2,3,6,7 PSO – 1,2)
CO3: Analyze the factors influencing the durability of concrete and evaluate concrete quality using non-destructive testing methods. (PO – 1,2,3,5,6,7 PSO – 1,2)
CO4: Illustrate proportioning of different types of concrete mixes for required fresh and hardened properties using professional code (PO – 1,2,3,4,5,6,7 PSO – 1,2).
CO5: Define special concretes, their application for practical purpose. (PO – 1,2,3,4,5,6,7 PSO – 1,2)

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

4. The question paper will have ten questions. Each question is set for 20 marks.
5. 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.
6. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text book/Codes:

1. MS Shetty, "Concrete Technology Theory and practice", S Chand and Company, 2006.
2. A M Neville, "Properties of Concrete", Fifth Edition, Pearson Education Asia Pvt ltd, 2014.

Reference Books

1. P K Mehta and Paulo JM Monteiro, "Concrete – microstructure, properties and materials", 4th Edition, McGraw Hill Education, 2017.

2. A R Santhakumar, "Concrete Technology", 2nd Edition, Oxford University Press – New Delhi, 2018.

3. Gambhir ML, "Concrete Technology", Tata McGraw-Hill Publishing Company, 5th Edition, New Delhi,2017.

IS: 383-2016. "Indian standard specification for coarse and fine aggregates from natural sources for concrete (Third revision)". Bureau of Indian Standards, New Delhi, India.

4. IS: 456-2000, Reaffirmed 2005. "Plain and Reinforced Concrete - Code of Practice". Bureau of Indian Standards, New Delhi, India.

5. IS: 10262-2019. "Indian standard concrete mix proportioning (Second revision)". Bureau of Indian Standards, New Delhi, India

Web links and Video Lectures (e-Resources): http://www.nptel.iitm.ac.in/
https://elearning.vtu.ac.in/

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

- Field Visits
- Quiz/Assignments/Open book test to develop skills
- Encourage collaborative learning in the class
- Case Study Analysis
- Industry Expert Talks / Guest Lectures

CO & PSO - PO Mapping (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes													
Course outcomes	**Program outcomes**											**Program Specific Outcomes**	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1													
CO2													
CO3													
CO4													
CO5													
Total													
Average													

Level 0: Not Mapped, 1: Low Mapped, 2: Moderately Mapped 3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

GEOTECHNICAL ENGINEERING			
Course Code	**24CV53**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	04	**Total Marks**	100
Contact Hours	40 hrs. Theory and 8-10 Lab slots	**Exam Hours**	3
Examination type (SEE)	Theory and Practical		

Course Objectives:

- Appreciate basic concepts of soil mechanics as an integral part in civil engineering.
- Become broadly familiar with geotechnical engineering requirements, such as, flow of water through soil medium and compaction characteristics
- To find out the compaction and consolidation of soil.
- To find out the shear strength of soil
- Model and measure strength & settlement characteristics and bearing capacity of soils.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Performing laboratory experiments to assess the desired properties of soil

Module-1 **8 Hours**

Index Properties and Classification

Index Properties: Phase Diagram, definitions, and their interrelationships. Determination of Index properties, Types of soil structures and Clay Minerals, IS soil classification of Soil.

Text Book: Chapter-1, 2, 3, 4, 5

Module-2 **8 Hours**

Soil Water-Effective Stress Analysis

Soil Water: Permeability, Darcy's law-assumption and validity, coefficient of permeability and its

determination (only laboratory method), permeability of stratified soils. Capillary phenomenon, Flow characteristics and applications net

Effective Stress Analysis: Effective stress concept-total stress, effective stress and Neutral stress.

Text Book: Chapter-6, 7

Module-3	8 Hours

Compaction and Consolidation

Compaction: Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control

Consolidation: Mass-spring analogy, Terzaghi's one dimensional consolidation theory (No derivation). Consolidation characteristics of soil (Cc, av, mv and Cv). Laboratory one dimensional consolidation test, Pre-consolidation pressure and its determination by Casagrande's method**.**

Text Book: Chapter- 15, 17

Module-4	8 Hours

Shear Strength

Concept of shear strength, Mohr–Coulomb Failure Criterion, Modified Mohr–Coulomb Criterion Total and effective shear strength parameters, Measurement of shear strength parameters - Direct shear test, unconfined compression test, triaxial compression test and field Vane shear test, Factors affecting shear strength of soils.

Text Book: Chapter- 18

Module-5	8 Hours

Bearing Capacity and Settlement

Bearing Capacity:

Types of foundations, Determination of bearing capacity by Terzaghi's and BIS methods (IS: 6403), Modes of shear failure, Factors affecting Bearing capacity of soil. Effect of water table and load eccentricity on bearing capacity of soil, Field methods of determining bearing capacity of soil (SPT and plate load test).

Settlement: Types of settlements and importance, Computation of immediate and consolidation settlement, permissible differential and total settlements (IS 8009 Part 1)**.**

Text Book Chapter- 24

PRACTICAL COMPONENT OF IPCC

SL. NO	Experiments
1	Water content determination by oven drying, Rapid moisture meter method
2	Grain size analysis (Sieve analysis of soil)
3	In-situ density tests i) Core-cutter method ii) Sand replacement method

4	Consistency limits i) Liquid limit test (by Casagrande's and cone penetration method) & ii) Plastic limit test
5	Co-efficient of permeability test i) Constant head test ii). Variable head test
6	Standard compaction test (light compaction only)
7	Direct shear test
8	Unconfined compression test & Laboratory vane shear test
9	Triaxial test (unconsolidated undrained test only)
10	Demonstration of Standard penetration test & Boring equipment
11	Demonstration of Proctors Needle
12	Demonstration of Vane shear test

Course outcomes (Course Skill Set):

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

CO1: Comprehend the fundamentals of Soil mechanics and identify and classify the soil
CO2: Carry out experiments to determine Permeability and effective stress analysis of soil.
CO3: Apply the knowledge to determine MDD and OMC and compute consolidation properties of soil
CO4: Carry out experiments to assess the Shear Strength characteristics of soil.
CO5: Apply the knowledge to determine shear parameters of soil and compute the settlement and bearing capacity of soil

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

CIE for the theory component of the IPCC (maximum marks 50)

Type equation here.IPCC means practical portion integrated with the theory of the course.

- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for

other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.

The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Textbook:

1. Punmia, B.C. (2004) Soil Mechanics and Foundations. 13th Edition, Laxmi Publications (P) Ltd.

Reference Books:

1. Seymour Lipschutz, D Murthy, V.N.S. (2002) Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering. Marcel Dekker Inc., New York.
2. Bowles, J.E. (2001) Foundation Analysis and Design. 5th Edition, McGraw-Hill, New York.
3. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics, New Age International (P) Ltd.,

New Delhi. 2016
4. Braja, M. Das, Geotechnical Engineering; Thomson Business Information India (P) Ltd., India. 2015

Web links and Video Lectures(e-Resources):

- https://nptel.ac.in/courses/105105039/2
- https://www.youtube.com/watch?v=Jy6lt6OTwaU
- https://www.youtube.com/watch?v=xUWqEA4CfZo
- https://nptel.ac.in/courses/105103097/24
- https://nptel.ac.in/courses/105103097/20
- https://nptel.ac.in/courses/105104137/module6/lecture20.pdf
- https://www.youtube.com/watch?v=gxsKH5zRWVI
- https://www.youtube.com/watch?v=YEltCJUZ0hk
- https://nptel.ac.in/courses/105105039/7
- https://www.youtube.com/watch?v=eqwT2hy29hk
- https://www.youtube.com/watch?v=eqwT2hy29hk

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
  - Case Study
  - Programming Assignment
  - Gate Based Aptitude Test
  - MOOC Assignment for selected Module

CONCRETE AND HIGHWAY LAB			
Course Code	**24CVL54**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	0:0:2	**SEE Marks**	50
Credits	01	**Total Marks**	100
Contact Hours	15	**Exam Hours**	3
Examination type (SEE)	Practical		

Prerequisites:

The students should have knowledge on

- Basic Engineering mathematics
- Building/construction materials
- Concrete and highway Engineering
- Strength of materials basics

Course Objectives:

- To learn the procedure of testing concrete ingredients and properties of concrete as per standard code recommendations.
- To learn the procedure of testing bituminous materials as per standard code recommendations.
- To relate material characteristics to various application of construction.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **15 Hours**

Part A: Concrete Lab

1. Tests on Cement:

a. Normal Consistency

b. Setting time

c. Compressive strength

d. fineness by air permeability test

e. specific gravity

2 Tests on Concrete:

Tests on fresh concrete:

i. Slump, ii. Compaction factor and iii. Vee Bee test

Tests on hardened concrete:

i) i Compressive strength test, ii. Split tensile strength test, iii. Flexural strength test.
ii) NDT tests by re bound hammer.

Tests on Self Compacting Concrete:

Design of self-compacting concrete, As per Is 10262:2019 b. slump flow test, c. V-funnel test, d. J-Ring test, e. U Box test and f. L Box test

Part B: Highway materials Lab

Tests on Aggregate**s**: a. Aggregate Crushing value b. Los Angeles abrasion test c. Aggregate impact test d. Aggregate shape tests(combined index and angularity number)

Tests on Bituminous Materials: a. Penetration test b. Ductility test c. Softening point test d. Specific gravity test e. Viscosity test by tarviscometer f. Bituminous Mix Design by Marshal Method (Demonstration only)

Tests on Soil**:** a. Wet sieve analysis b. CBR test

Course outcomes (Course Skill Set):
At the end of the course, the student will be able to:

- Able to interpret the experimental results of concrete and highway materials based on laboratory tests.
- Determine the quality and suitability of cement.
- Design appropriate concrete mix Using Professional codes.
- Determine strength and quality of concrete.
- Evaluate the strength of structural elements using NDT techniques.
- Test the soil for its suitability as sub grade soil for pavements.

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/

course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Question paper pattern:

- All are individual experiments Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
- All exercises are to be included for practical examination

Suggested Learning Resources:

Reference Books:

1. M. L. Gambir, "Concrete Manual", Danpat Rai and sons, New Delhi
2. Shetty M.S, "Concrete Technology", S. Chand &Co. Ltd, New Delhi. Mehta P.K, "Properties of Concrete", Tata Megraw Hill Publications, New Delhi.
3. Neville AM, "Properties of Concrete", ELBS Publications, London. Relevant BIS codes.
4. S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing Laboratory Manual", Nem Chand Bros, Roorkee.
5. L R Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi.

REMOTE SENSING AND GIS			
Course Code	**24CV55A**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Engineering Mathematics
- Fundamentals of Surveying
- Basic Computer Knowledge
- Fundamentals of Earth Science

Course Objectives:

- Understand concept of using photographic data to determine relative positions of points.
- Study the methods of collection of land data using Terrestrial and Aerial camera.
- Analyse the data gathered from various sensors and interpret for various applications.
- Apply the principles of RS, GIS and GPS in various scopes of Civil Engineering

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **8 Hours**

Remote Sensing: Definition, types of remote sensing, components of remote sensing, electromagnetic spectrum, Black body, Atmospheric windows, energy interaction with earth surface features. Spectral reflectance curve. Platforms and sensors. Sensor resolutions. Types of satellites Indian and other remote sensing satellites (IRS, IKONS and Landsat). Principle of visual interpretation - key elements.

Text Book: Chapter-1,2

Module-2 **8 Hours**

Photogrammetry: Introduction types of Photogrammetry, Advantages Photogrammetry, Introduction to digital Photogrammetry. Aerial Photogrammetry: Advantages over ground survey methods- geometry of vertical photographs, scales of vertical photograph. Ground coordination relief displacement, scale ground

coordinates – flight planning

Text Book: Chapter-8

Module-3 **8 Hours**

Geographic Information System: Introduction, Functions and advantages, sources of data for GIS. Database – Types, advantages and disadvantages. Data Analysis.-overlay operations, network analysis, spatial analysis. Outputs and map generation. GPS- components and working principles.

Text Book: Chapter-13,14

Module-4 **8 Hours**

Applications of GIS, Remote Sensing and GPS: (1) Water Resources engineering and management-prioritization of river basins, water perspective zones and its mapping, Highway and transportation - highway alignment, Optimization of routes, accident analysis, Environmental Engineering- Geostatistical analysis of water quality, rainfall.

Text Book: Chapter-18

Module-5 **8 Hours**

Applications of GIS, Remote Sensing and GPS: (2) Urban Planning & Management, urban sprawl, Change detection studies, forests and urban area, agriculture, Disaster Management. Layouts: Dead end, Radial, Grid iron, Circular system.

Text Book Chapter-19

Course outcomes (Course Skill Set):

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

CO1: Understand and remember the principle of Remote Sensing (RS) and Geographical Information Systems (GIS) data acquisition and its applications. (PO – 1,2, 5,6,7, PSO – 1,2)

CO2: Describe the principles of photogrammetry and interpret aerial photographs for mapping and engineering analysis. (PO – 1,2, 5,6,7, PSO – 1,2)

CO3: Demonstrate the concepts and components of Geographic Information Systems (GIS), including data models, spatial data structures, and database management. (PO – 1,2, 5,6,7, PSO – 1,2)

CO4: Analyze and evaluate the information obtained by applying RS and GIS technologies. (PO – 1,2, 5,6,7, PSO – 1,2)

CO5: Create a feasible solution in the different fields of application of RS and GIS. (PO – 1,2, 5,6,7, PSO – 1,2)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and

for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Textbook:

1. Remote Sensing and GIS, Bhatta B, 2011, Oxford University Press, New Delhi, I

Reference Books:

1. Geographic Information System-An Introduction, Tor Bernharadsen, 2009, 3rd Edition, Wiley India Pvt. Ltd. New Delhi, ISBN - 9788126511389.
2. Principles of Remote sensing and Image Interpretation, Lillesand and Kiefer, 2011, 6th Edition, John Wiley Publishers, New Delhi, ISBN – 8126532238.
3. Higher Surveying, Chandra A.M, 2015, 3rd Edition, New age international (P) Ltd, ISBN: 8122438121
4. Remote Sensing, Robert A. Schowengerdt, 2009, 3rd Edition, Elsevier India Pvt Ltd, New Delhi.

Web links and Video Lectures(e-Resources):

- **NPTEL lecture videos**

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

- Hands on session on QGIS/Arc GIS
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
    - Case Study
    - Presentation
    - Quiz

GROUND WATER HYDRAULICS			
Course Code	**24CV55B**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on:

- A strong foundation in Physical Sciences, Engineering Mechanics and Geology
- Requires a combined understanding of how water flows in porous media
- Properties of Geological formations
- Soil mechanics
- Mathematical methods to analyze these systems

Course objectives:

- To explain the significance of Ground water
- Paraphrasing the characteristics of aquifers
- To quantify the Ground water flow by different methods
- To locate occurrence of ground water and synthesize ground water development
- To explore ground water by different methods

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1	8 hrs
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. **L1, L2** **Text Book**: Chapter 7: 7.1 to 7.2	
Module-2	**8 hrs**
Water bearing properties Derivation of Darcy's law, Hydraulic conductivity, coefficient of permeability and Intrinsic permeability Permeability in isotropic, anisotropic soils, Steady One-dimensional flow **L1**, **L2** **Text Book**: Chapter 7: 7.3 to 7.4	
Module-3	**8 hrs**
Well Hydraulics 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 **L1, L2** **Text Book**: Chapter 7: 7.5 to 7.7	
Module-4	**8 hrs**
Groundwater exploration and Development 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 **L1, L2, L3** **Text Book:** Chapter 7: 7.8 to 7.9	
Module-5	**8 hrs**
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 **L1, L2, L3** **Text Book:** Chapter 7: 7.10	

Course outcomes (Course Skill Set):

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

CO1: To characterize the properties of ground water and aquifers. (PO – 1,2,3,4,5,6,7 PSO – 1,2)
CO2: To quantify the ground water flow. (PO – 1,2,3,4,5,6,7 PSO – 1,2)
CO3: To synthesize ground water development methods (PO – 1,2,3,4,5,6,7 PSO – 1,2)
CO4: To locate the occurrence of ground water and augment ground water resources (PO – 1,2,3,4,5,6,7 PSO – 1,2)
CO5: To measure the ground water quality. (PO – 1,2,3,4,5,6,7 PSO – 1,2)

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

4. The question paper will have ten questions. Each question is set for 20 marks.
5. 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.
6. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books:

1. H.M.Raghunath, "Ground water" by , Wiley Eastern Publishers, New Delhi

2. K.Todd , "Groundwater Hydrology", Wiley Eastern Publishers, New Delhi

Reference Books

1. Garg Satya Prakash, "Groundwater and Tube wells", Oxford and IBH Publication, New Delhi

2. W.C.Walton," Groundwater Resources and Evaluation", Tata Mc Graw Hill Publishers, New Delhi

3. Michael, D.M,, Khepar,,S.D, and Sondhi,S.K, "Water Wells and pumps- ", Mc GrawHill,Delhi Standard Book House, Delhi.

- https://www.youtube.com/watch?v=g8X7V4Nldj4
- https://www.youtube.com/watch?v=encyNoxD32c
- https://www.youtube.com/watch?v=0GKXDHPEBwM
- https://www.youtube.com/watch?v=-bYptlimsdI
- https://www.youtube.com/watch?v=3uBS-6eDVHQ
- https://www.youtube.com/watch?v=AOWjiXXkUcc
- https://www.youtube.com/watch?v=rtGOwqYjzWc
- https://www.youtube.com/watch?v=rDQcGWbS3Ro
- https://www.youtube.com/watch?v=cff4CMdt8Ws
- https://www.youtube.com/watch?v=WrVL_KoTQeo
- https://www.youtube.com/watch?v=zmNYKGsBWJc
- https://www.youtube.com/watch?v=cfDOZsC_yd8
- NPTEL materials

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

- Field Visits
- Quiz/Assignments/Open book test to develop skills
- Encourage collaborative learning in the class
- Demonstration of Geological models and animations
- Hands on experiments with Rock and Minerals

<u>CO & PSO - PO Mapping</u> (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes														
Course outcomes	**Program outcomes**												**Program Specific Outcomes**	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1	1	1	1						2	1
CO2	2	3	1	1	1	1	1						2	1
CO3	2	3	2	1	1	1	1						2	1
CO4	1	1	1	3	2	1	1						2	1
CO5	1	3	2	1	2	1	1						2	1
Total														
Average														

Level 0: Not Mapped, 1: Low Mapped, 2: Moderately Mapped 3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

SOLID WASTE MANAGEMENT			
Course Code	**24CV55C**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Waste Characterization
- Segregation at Source
- Public Awareness and Participation
- Environmental and Health Safeguards

Course Objectives:

- To facilitate the learners to understand fundamentals of key elements in solid waste management and governance.
- To impart knowledge to arrive strategies for waste management and selection of technologies for processing, treatment, and disposal.
- To examine and plan designs for material recovery facility, micro composting units, incinerators, biodigesters, and landfills

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1	**8 Hours**

Introduction to Solid waste management Definition, Classification, need and Global perspective of solid waste management. Policies and legislative frameworks, Government initiatives on Solid waste management. Integrated solid waste management and concept of 3R's, Role of stakeholders

Text Book: Chapter-1:1.1,1.8

Module-2	**8 Hours**

Waste generation and characterization Factors affecting waste generation and methods to estimate the quantity of waste generated. Physical, chemical, and biological methods of waste characterization.

Text Book: Chapter-2: 2.1 to 2.6

Module-3 **8 Hours**

Storage, collection, and Transportation of waste Methods of storage, Storage container types and materials, onsite processing. Methods of collection and collection vehicles, Analysis, and design of Hauled and Stationary container systems with case studies. Transfer stations – feasibility and economic analysis.

Text Book: Chapter-3: 3.1 to 3.8

Module-4 **8 Hours**

Waste processing and Disposal Waste processing facilities- MRFs Landfills – Selection of liners, Design, Closure and Leachate management,

Text Book: Chapter-4:4.1 to 4.6

Module-5 **8 Hours**

Special Waste and Smart Solid Waste Management Definition, Classification, Effects, treatment, disposal, Legislation and case studies of Hazardous waste, Construction and demolition waste, Electronic waste, Plastic, Biomedical waste and Radioactive waste. Life cycle assessment of solid waste management, Automation and IOT in storage, collection and treatment of solid waste. Case studies.

Text Book Chapter-6: 6.1 to 6.5

Course outcomes (Course Skill Set):

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

CO1: Articulate the elements of solid waste management and categorize the waste based on physical, chemical, and biological characteristics. (PO – 1,6,7,8,10, PSO – 1,2)

CO2: Design a waste collection system for onsite collection, storage and demonstrate waste transfer and transport operations. (PO – 1,6,7,8,10, PSO – 1,2)

CO3: Evaluate and develop waste processing and treatment methods for solid and hazardous waste with sustainable practices. (PO – 1,6,7,8,10, PSO – 1,2)

CO4: Select appropriate disposal methods such as landfills, waste to energy plants and its handling in an efficient way. (PO – 1,6,7,8,10, PSO – 1,2)

CO5: Develop reduce, reuse, and recycling methods for special waste and prepare smart solutions for solid waste management (PO – 1,6,7,8,10, PSO – 1,2)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and

for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Textbook:

Handbook of Solid Waste Management by Frank Kreith, George Tchobanoglous 1994

Reference Books:

1. Management of Municipal Solid waste by T.V. Ramachandra 2009
2. Hazardous Waste management by Michael D LaGrega, Philip. L. Buckingham, Jeffery C. Evans 2001
3. Manuals and best practices in solid waste management by Swachh Bharat Mission

Web links and Video Lectures(e-Resources):

- Introduction to solid waste https://www.youtube.com/watch?v=k0ktJRoRcOA
- Solid waste management https://www.youtube.com/watch?v=sMeUGwpvLtk

- Municipal Solid Waste Management (Civil Engineering) https://www.digimat.in/nptel/courses/video/105103205/L01.html
- Primary collection SWM https://www.digimat.in/nptel/courses/video/105103205/L09.html
- Solid waste types, methods, challenges and solutions https://www.youtube.com/watch?v=T_pIJiZ8JYI
- Types and sources of SWM https://www.digimat.in/nptel/courses/video/105103205/L03.html

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
    - Case Study
    - Presentation
    - Quiz

BUILDING INFORMATION MODELLING (BIM)			
Course Code	**24CV56A**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	04	**Total Marks**	100
Contact Hours	45	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Understanding of Civil Engineering materials, construction methods, and building components.
- Familiarity with Computer-Aided Design (CAD) software such as AutoCAD.
- Basic computer skills and knowledge of construction project workflows.
- Fundamental understanding of structural, architectural, and MEP systems.

Course Objectives:

This course will enable students to

- Understand the fundamentals, importance, and standards of Building Information Modelling (BIM) in the AEC industry.
- Learn the use of BIM software tools and their applications throughout the project lifecycle.
- Explore BIM applications in design, construction, operation, maintenance, and renovation, emphasizing collaboration among stakeholders.
- Gain knowledge of advanced BIM concepts, including sustainable design, infrastructure projects, emerging technologies, and future trends.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **5 Hours**

Introduction to BIM Understanding BIM Definition and Importance of BIM, Historical Development of BIM, Key Concepts and Terminology BIM Standards and Protocols International BIM Standards, National BIM Standards, BIM Execution Plans (BEP) and Protocols BIM Software and Tools Overview of Popular BIM Software (e.g., Revit, Lumion), Comparison of Different BIM Tools, Introduction to BIM Interoperability BIM Implementation Process Steps in Implementing BIM in Projects, Challenges and Barriers in BIM Adoption, Case Studies of Successful BIM Implementation

Text Book: 1

Module-2	**8 Hours**
BIM in Project Lifecycle BIM in Design Phase Role of BIM in Architectural Design, Collaboration between Architects and Engineers, Design Visualization and Analysis using BIM BIM in Construction Phase BIM for Construction Planning and Management, 4D BIM (Time Dimension) and 5D BIM (Cost Dimension), Construction Simulation and Sequencing BIM in Operation and Maintenance BIM for Facility Management, Integrating BIM with Building Management Systems (BMS), Lifecycle Asset Management using BIM BIM for Renovation and Retrofit Projects BIM for Existing Buildings and Infrastructure, Challenges in Using BIM for Renovation, Case Studies of BIM in Renovation Projects **Text Book**: 1
Module-3
BIM Collaboration and Coordination, BIM Collaboration Techniques Collaborative Design and Engineering, Communication and Data Sharing in BIM Projects, Role of Common Data Environment (CDE) BIM Coordination and Clash Detection Coordination between Different Disciplines, Clash Detection and Resolution Techniques, Tools for BIM Coordination (e.g., Navisworks) BIM and Integrated Project Delivery (IPD) Principles of IPD, Benefits of IPD with BIM, Case Studies of BIM in IPD Projects Legal and Contractual Aspects of BIM BIM in Contract Documents, Intellectual Property and Data Ownership, Risk Management in BIM Projects **Text Book**:1
Module-4
Advanced BIM Concepts BIM for Sustainable Design BIM for Energy Analysis and Simulation, Green Building Certifications and BIM, Sustainable Materials and BIM BIM for Infrastructure Projects BIM Management Roles and Responsibilities, Developing a BIM Execution Plan, BIM for Project Managers Application of BIM in Civil Engineering Projects, BIM for Transportation Infrastructure, Case Studies of BIM in Infrastructure Projects BIM and Emerging Technologies BIM and Internet of Things (IoT), Augmented Reality (AR) and Virtual Reality (VR) in BIM, Artificial Intelligence (AI) and Machine Learning in BIM Future Trends in BIM Trends Shaping the Future of BIM, BIM in Smart Cities and Digital Twins, Global Perspective on BIM Adoption **Text Book**:1
Module-5
BIM Management BIM Management Strategies, BIM Research and Development Current Research in BIM, Future Research Directions in BIM, Opportunities for Innovation in BIM Case Studies and Best Practices Analysis of Successful BIM Projects, Lessons Learned from BIM Implementation, Best Practices in BIM Management and Execution
Course outcomes (Course Skill Set): At the end of the course, the student will be able to **CO1**: Demonstrate a thorough understanding of BIM concepts, history, and terminology, and apply international and national BIM standards and protocols effectively in projects. (PO – 1,2,5,6,7 10, PSO – 1,2)

CO2: Utilize various BIM software tools for different project phases, ensuring interoperability among them, and develop and execute a BIM implementation plan, addressing challenges and barriers. (PO – 1,2,5,6,7 10, PSO – 1,2)

CO3: Apply BIM techniques in the design, construction, operation, maintenance, and renovation phases of a project, and facilitate effective collaboration and coordination among project stakeholders using BIM tools and techniques. (PO – 1,2,5,6,7 10, PSO – 1,2)

CO4: Analyze and implement advanced BIM concepts such as sustainable design, infrastructure projects, and emerging technologies. (PO – 1,2,5,6,7 10, PSO – 1,2)

CO5: Manage BIM projects effectively, develop educational programs, and apply best practices in BIM management and execution. (PO – 1,2,5,6,7 10, PSO – 1,2)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

Textbook

1. "BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers" by Chuck Eastman, Paul Teicholz, Rafael Sacks, and Kathleen Liston.

. **Reference Books:**

1. Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations" by Willem Kymmell.
2. "BIM and Construction Management: Proven Tools, Methods, and Workflows" by Brad Hardin and Dave McCool.
3. . "Design Integration Using Autodesk Revit 2020" by Daniel John Stine and Aaron Hansen.
4. ."Practical BIM: Auditing Implementations for Conformance to Industry Standards" by Cameron Warren.

Web links and Video Lectures(e-Resources):

- Web links and Video Lectures (e-Resources):
- https://swayam.gov.in
- https://nptel.ac.in
- http://elearning.vtu.ac.in

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

- Flipped classroom activity
- • Group works
- • Case study analysis

PRE -ENGINEERED CONSTRUCTION TECHNOLOGY			
Course Code	**24CV56B**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	04	**Total Marks**	100
Contact Hours	45	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Foundational knowledge in civil engineering, particularly in structural design, materials, and management.

Course Objectives:

- This course will enable students to
- Understand the type of prefabricated elements.
- Understand the method of hoisting.
- Understand the basic construction of the pre-engineered buildings.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

4. Chalk and Talk with Black Board
5. ICT based Teaching
6. Demonstration based Teaching

Module-1 **5 Hours**

General Principles of Pre Fabrication: Comparison with monolithic construction, Types of prefabrication, site and plant prefabrication, Economy of prefabrication, Modular coordination, Standardization, Planning for Components of prefabricated structures, Disuniting of structures, Handling and erection stresses, Elimination of erection stresses (Beams, columns) Symmetrical frame

Text Book: Chapter-1:1.2 Chapter-2: 2.1 to 2.7

Module-2 **8 Hours**

Prefabricated Elements: Roof and floor panels, ribbed floor panels, wall panels, footings, Joints for different structural Connections, Effective sealing of joints for water proofing, Provisions for non-structural fastenings, Expansion joints in pre-cast construction. Construction of precast structural components (Purlins, Principal rafters, roof trusses, lattice girders, gable frames, Single span single storeyed frames, Single storeyed buildings – slabs, beams and columns. Construction and demolition wastes.

Text Book: Chapter-3: 3.1,3.2,3.6 3.3, 3.4, 3.7

Module-3	8 Hours
Production and Hoisting Technology: Choice of production setup, Manufacturing methods, Stationary and mobile production, Planning of production setup, Storage of precast elements, Dimensional tolerances, Acceleration of concrete hardening. Equipment's for hoisting and erection, Techniques for erection of different types of members like Beams, Slabs, Wall panels and Columns, Vacuum lifting pad **Text Book**: Chapter-4: 4.1 to 4.4 4.5,4.7,4.8	
Module-4	**8 Hours**
Precast sandwich Panels, Pre-stressed concrete solid flat slabs, Hollow core slab/panels, pre-stressed concrete Double "T", Bridge, Precast segmental Box Girders, Specifications and design considerations **Text Book**: Chapter-5: 5.1 to 5.3, 5.5 ,5.7 to 5.11	
Module-5	**8 Hours**
Pre-Engineered Buildings: Introduction, Advantages, Pre-Engineered Buildings Vs. Conventional Steel Buildings, Design Consideration of Pre-Engineered Buildings (PEB) – Applications **Text Book** Chapter-6: 6.1, 6.2 Chapter 8: 8.1 to 8.3	

Course outcomes (Course Skill Set):

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

CO1: To design the pre-engineered structures and execute the same for a given structure

CO2: To know the different types of stresses acting on the structures while lifting the prefabricated structures and type of equipment required to support such stresses

CO3: Know Production and Hoisting Technology

CO4: Impact of different Precast sandwich Panels, Pre-stressed concrete in construction industry

CO: Apply the latest Pre-Engineered Buildings equipment technique in the construction industry.

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only

one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)

- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (duration 03 hours).

4. The question paper will have ten questions. Each question is set for 20 marks.
5. 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.
6. The students have to answer 5 full questions, selecting one full question from each module.
7. Marks scored shall be proportionally reduced to 50 marks.

Textbook

2. L. Mokk, "Prefabricated Concrete for Industrial and Public Structures" Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.
3. T. Koncz, "Manual of Precast Concrete Construction", Vol. I, II, III & IV, Berlin,1971.

Reference Books:

1. B. Lewicki, "Building with Large Prefabricates", Elsevier Publishing Company, Amsterdam, London, New York, 1998.
2. Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in the use of Precast Concrete, Netherland BetorVerlag, 2009.
3. Hass, A.M. Precast concrete design and Applications, Applied Science Publishers,1983

Web links and Video Lectures(e-Resources):

- Web links and Video Lectures (e-Resources):
- https://swayam.gov.in
- https://nptel.ac.in
- http://elearning.vtu.ac.in

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
    - Case Study, Gate Based Aptitude Test

URBAN TRANSPORTATION AND PLANNING			
Course Code	**24CV56C**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Basic Understanding of urban systems
- Fundamentals of Transportation engineering
- Basic analytical and modeling skills
- Traffic data collection techniques

Course Objectives:

- Understand and apply basic concepts and methods of urban transportation planning.
- Apprise about the methods of designing, conducting and administering surveys to provide the data required for transportation planning.
- Understand the process of developing an organized mathematical modelling approach to solve select urban transportation planning problem.
- Excel in use of various types of models used for travel forecasting, prediction of future travel patterns.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **8 Hours**

Urban transport planning: Urbanization, urban class groups, transportation problems and identification, impacts of transportation, urban transport system planning process, modeling techniques in planning. Urban mass transportation systems: urban transit problems, travel demand, types of transit systems, public, private, para-transit transport, mass and rapid transit systems, BRTS and Metro rails, capacity, merits and comparison of systems, coordination, types of coordination.

Text Book: Chapter-29:29.1 to 29.13 Chapter-30: 30.1 to 30.15

Module-2 **8 Hours**

Data Collection And Inventories: Collection of data – Organization of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population

– Employment – Vehicle Owner Ship. **Text Book**: Chapter-30: Chapter-30: 30.1 to 30.15

Module-3 **8 Hours**

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution by Growth Factor Methods. Problems on above. **Text Book**: Chapter-31: 31.1 to 31.5

Module-4 **8 Hours**

Trip Distribution: Gravity Models, Opportunity Models, Time Function Iteration Models. Travel demand modeling: gravity model, opportunity models, Desire line diagram. Modal split analysis. Problems on above. **Text Book**: Chapter-32: 32.1 to 32.10

Module-5 **8 Hours**

Traffic Assignment: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment. Numerical problems on Traffic Assignment. Introduction to land use planning models, land use and transportation interaction.

Text Book Chapter-33: 33.1to 33.7 Chapter 34: 34.1 to 34.4

Course outcomes (Course Skill Set):

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

CO1: Understand the role of urban transportation in city development. (PO – 1,2,3, PSO – 1,3)
CO2: Apply transportation planning processes including data collection. (PO – 1,2,3, PSO – 1,3)
CO3: Analyze urban transportation system using planning models (PO – 1,2,3, PSO – 1,3)
CO4: Adopt the steps that are necessary to complete a long-term transportation plan. (PO – 1,2,3, PSO – 1,3)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the

syllabus. The average of the two tests shall be scaled down to 25 marks.

- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Textbook:

1.Kadiyali. L. R., 'Traffic Engineering and Transportation Planning', Khanna Publishers, New Delhi. 2.

Reference Books:

1. Mayer M and Miller E, 'Urban Transportation Planning: A decision oriented Approach', McGraw Hill.
2. Bruton M.J., 'Introduction to Transportation Planning', Hutchinson of London.
3. Dicky, J.W., 'Metropolitan Transportation Planning', Tata McGraw Hill.
4. Papacostas, 'Fundamentals of Transportation Planning', Tata McGraw Hill.

Web links and Video Lectures(e-Resources):

- https://www.youtube.com/watch?v=1tURiB97Klw&list=PLmRuqPJhrsb5se7Efa5aEOMvg9NFSJ6xo
- https://www.youtube.com/watch?v=d6pFDkKn0lQ&list=PLmRuqPJhrsb5se7Efa5aEOMvg9NFSJ6xo&index=2
- https://www.youtube.com/watch?v=PtI-BlmhcZE&list=PLmRuqPJhrsb5se7Efa5aEOMvg9NFSJ6xo&index=4
- https://www.youtube.com/watch?v=8HKw-kcolFg&list=PLmRuqPJhrsb5se7Efa5aEOMvg9NFSJ6xo&index=16

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
    - Case Study
    - Programming Assignment
    - Gate Based Aptitude Test
    - MOOC Assignment for selected Module

ENVIRONMENTAL STUDIES AND E WASTE MANAGEMENT (ECE, CIVIL AND MECHANICAL BRANCH ONLY)			
Course Code	**24ES57**	**CIE Marks**	100
Teaching Hours/Week (L: T: P)	1:0:0:0	**SEE Marks**	-
Credits	-	**Total Marks**	100
Contact Hours	14	**Exam Hours**	-
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on:

- Understanding of Ecosystems and Sustainability
- Awareness of Environmental Issues
- Familiarity with Environmental Legislation
- Basic Scientific Principles
- Knowledge of E-waste Lifecycle
- Familiarity with E-waste Recycling Methods
- Awareness of Environmental Policies

Course objectives:

- Identify the major challenges of environmental issues
- Develop skills, critical thinking and demonstrate socio-economic skills for Environmental protection
- Analyze the impact of issues w. r. t. waste management

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes Critical thinking.
5. Adopt Case study Based Learning (CBL), which fosters students' analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.

Module-1	**2 hrs**
Ecosystem and Sustainability Ecosystems (Structure and Function): Forest, Desert, Wetlands, River, Oceanic and Lake. Sustainability: 17 SDGs-History, targets, implementation, Capacity Development **L1, L2** **Text Book 1**: CH- 3, e-resource:1	
Module-2	**2 hrs**
Natural resources and Energy Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining - case studies and Carbon Trading **L1, L2** **Textbook 1**: CH- 2	
Module-3	**3 hrs**
Environmental Pollution and Waste Management Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. Waste Management: Bio-medical Wastes; Solid waste; Hazardous wastes; E-wastes; Industrial and Municipal Sludge **Textbook 1:** CH- 5 **L1, L2**	
Module-4	**3 hrs**

Global Environmental Issues

Global Environmental Concerns (Concept, policies and case-studies): Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology.

L1, L2

Textbook 1: CH- 6, e-resource:2

Module-5 4 hrs

Environmental Legislation

Environmental Legislation : Water Act 1974, Air Act 1981, Environmental Protection Act 1984, Solid Waste Management Rules-2016, E- Waste management Rule - 2022, Biomedical Waste management- 2016.

L1, L2

Textbook 1: CH- 6, Textbook 2: CH-2, e-resource:3

Course outcomes (Course Skill Set):

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

CO1: Comprehend the principles of ecology and environmental issues pertaining to air, land, and water on a global scale. (PO – 1,2,3,4,6,7 PSO – 1,2)

CO2: Acquire observation skills for solving problems related to the environment. (PO – 1,2,3,4,6,7 PSO – 1,2)

CO3: Conduct survey to describe the realities of waste management system. (PO – 1,2,3,4,5,6,7 PSO – 1,2)

CO4: Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues (PO – 1,2,3,4,5,6,7 PSO – 1,2)

CO5: Understand the sources, types, and composition of electronic waste and its impact on the environment and human health. (PO – 1,2,3,4,5,6,7 PSO – 1,2)

Assessment Details

The weightage of Continuous Internal Evaluation (CIE) is 100% and the minimum passing mark for the CIE is 40% of the maximum marks (40 marks out of 100). 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 CIE (Continuous Internal Evaluation).

Continuous Internal Evaluation:

- There are 50 marks for the CIE's Assignment component and 50 for the Internal Assessment Test component.
- Each test shall be conducted for 50 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 50 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. The final CIE marks of the course out of 100 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Suggested Learning Resources:

Text Book:

1. S M Prakash , "Environmental Studies" 3rd Edition, Elite Publishing House, Mangalore, 2018.
2. Hester R.E., and Harrison R.M, Electronic Waste Management. Science, 2009.

Reference Books

1. Earch Barucha, "Environmental Studies for UG students", 2004.
2. Benny Joseph (2005), "Environmental Studies" , Tata McGraw – Hill Publishing Company Limited.
3. R. Rajagopalan, "Environmental Studies- From Crisis to Cure" , 2nd Edition, Oxford university press, New Delhi, 2013.

- https://www.youtube.com/watch?v=VYVriv2vWxE
- https://www.youtube.com/watch?v=yxA6ilJp5fk
- https://www.youtube.com/watch?v=Ccu_wQqT1kA
- https://www.youtube.com/watch?v=hqq4waDUrnk
- https://www.youtube.com/watch?v=RQSM4Z-hgUo
- https://www.youtube.com/watch?v=oepriQ_TOLo
- https://www.youtube.com/watch?v=qS8mfAX1tAk
- NPTEL materials

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

- Field Visits
- Quiz/Assignments/Open book test to develop skills
- Encourage collaborative learning in the class

CO & PSO - PO Mapping (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes														
Course outcomes	**Program outcomes**												**Program Specific Outcomes**	
	PO 1	PO 2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1	1		2	2					2	1
CO2	2	3	1	1	1		2	2					2	2
CO3	2	2	3	1	2		1	1					2	1
CO4	2	2	2	2	2		2	2	1				2	1
CO5	2	2	2	2	2		2	2					2	1
Total														
Average														

Level 0: Not Mapped, 1: Low Mapped,2: Moderately Mapped3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

IRRIGATION ENGINEERING AND HYDRAULIC STRUCTURES			
Course Code	**24CV61**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Basic knowledge of Fluid Mechanics
- Fundamentals of Hydrology
- Understanding of Engineering Mathematics
- Basics of Engineering Drawing
- Elementary concepts of Soil Mechanics

Course Objectives:

- Analyse and design gravity dams.
- Find the cross-section of earth dam and estimate the seepage loss.
- Design spillways and aprons for diversion works.
- Design CD works and chose appropriate canal regulation works.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Blackboard teaching
2. Power point Presentation
3. Videos, NPTEL materials
4. Quiz/Assignments/Open book test to develop skills.

Module-1 **8 Hours**

Irrigation: Definition. Benefits and ill effects of irrigation. System of irrigation: surface and ground water, flow irrigation, lift irrigation, Bandhara irrigation. Water Requirements of Crops: Duty, delta and base period, relationship between them, factors affecting duty of water crops and crop seasons in India, irrigation efficiency, frequency of irrigation

Text Book: Chapter-1,2,3

Module-2 **8 Hours**

Canals: Types of canals. Alignment of canals. Definition of gross command area, cultural command area, intensity of irrigation, time factor, crop factor. Unlined and lined canals. Standard sections. Design of

canals by Lacey's and Kennedy's method. Reservoirs: Definition, investigation for reservoir site, storage zones determination of storage capacity using mass curves, economical height of dam.

Text Book: Chapter-13,14

Module-3 **8 Hours**

Introduction to Dams- classification and functions of dams, Site selection criteria for dams, Forces acting on dams.

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile, and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety – Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.

Text Book: Chapter-7,8

Module-4 **8 Hours**

Earth dams: Types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage. Spillways: types of spillways, Design principles of Ogee spillways – Spillway gates. Energy Dissipaters and Stilling Basins Significance of Jump Height Curve and Tail Water Rating Curve – USBR and Indian types of Stilling Basins.

Text Book: Chapter-10 10.1 to 10.6,11.1 to 11.11

Module-5 **8 Hours**

Diversion Head works: Types of Diversion head works- weirs and barrages, layout of diversion head work – components. Causes and failure of Weirs and Barrages on permeable foundations, -Silt Ejectors and Silt Excluders, Weirs on Permeable Foundations – Creep Theories – Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction Factors – Design principles of weirs on permeable foundations using Creep theories – exit gradient, U/s and D/s Sheet Piles – Launching Apron.

Text Book: Chapter-12: 12.1 to 12.16

Course outcomes (Course Skill Set):

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

CO1: Understand details in any Irrigation System and its requirements (PO – 1,2,6, PSO – 1,2)

CO2: Apply hydraulic principles to the design of canals and irrigation distribution systems. (PO – 1,3,6,11 PSO – 1,2)

CO3: Analyze gravity dams considering stability, forces acting on the dam, and failure modes. (PO – 1,2,3,6,11 PSO – 1,2)

CO4: Analyze and design earthen dams and spillways considering seepage control, slope stability, failure mechanisms, hydraulic performance, and energy dissipation. (PO – 1,2,3,6 PSO – 1,2)

CO5: Analyze and design diversion head works considering creep theories, hydraulic performance, energy dissipation, and safety against failure. (PO – 1,3,6 PSO – 1,2)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40 -50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Textbook:

1. Irrigation and water power engineering by Punmia & Lal, Laxmi publications Pvt. Ltd., New Delhi

Reference Books:

1. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg, Khanna Publishers.
2. Irrigation Engineering by K. R. Arora Standard Publishers.
3. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta

Web links and Video Lectures(e-Resources):

- **NPTEL Videos**
- **https://elearning.vtu.ac.in/**

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
  - Presentation
  - Quiz
  - Field visit
  - Case study discussion
  - Assignment

DESIGN OF RCC STRUCTURES			
Course Code	**24CV62**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:2	**SEE Marks**	50
Credits	04	**Total Marks**	100
Contact Hours	40 hours Theory + 8-10 Lab slots	**Exam Hours**	3
Examination type (SEE)	Theory + Lab		

Prerequisites: The students should have knowledge on

- Structural Analysis
- Engineering Mechanics
- Basic knowledge of construction materials

Course Objectives:

- Identify, formulate and solve engineering problems of RC elements subjected to different kinds of loading.
- Follow a procedural knowledge in designing various structural RC elements.
- Impart the usage of codes for strength, serviceability and durability.
- Acquire knowledge in analysis and design of RC elements.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 — 8 Hours

Introduction to working stress and limit State Design: Introduction to working stress method, Difference between Working stress and Limit State Method of design. Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section. Limiting deflection, short term deflection, long term deflection, Calculation of deflection of singly reinforced beam only.

Text Book-1: Chapter-2:2.1 to 2.6 Chapter-32: 32.1 to 32.3 Chapter-33:33.1 to 33.7

Module-2	8 Hours
Limit State Analysis of Beams: Analysis of singly reinforced, doubly reinforced and flanged beams for flexure and shear. **Text Book-**1: Chapter-5: 5.1 to 5.6	
Module-3	**8 Hours**
Limit State Design of Beams: Design of singly reinforced beams with check for shear, check for development length and other checks. Design of doubly reinforced beams and flanged sections without checks. **Text Book-**1: Chapter-37: 37.1 to 37.6	
Module-4	**8 Hours**
Limit State Design of Slabs and Stairs: Introduction to one way and two way slabs, Design of Cantilever, simply supported and one way continuous slab. Design of two way slabs for different boundary conditions. Design of dog legged and open well staircases **Text Book-**1: Chapter-40: 40.1 to 40.4, Chapter-41: 41.1 to 41.3	
Module-5	**8 Hours**
Limit State Deign of Columns and Footings: Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments, Design concepts of the footings. Design of Rectangular and square column footings with axial load. **Text Book-**1 Chapter-38: 38.1, 38.8 Chapter 44: 44.1 to 44.3	

PRACTICAL COMPONENT OF IPCC (May cover all / major modules)

Sl.NO	Experiments
1	Calculation of deflection of singly reinforced beam using Excel
2	Design of a simply supported RCC singly reinforced beam using Excel and draw the reinforcement details
3	Design of a simply supported RCC doubly reinforced beam using Excel and draw the reinforcement details
4	Design of singly reinforced beams with check for shear, check for development length and other checks using Excel.
5	Design of a cantilever beam using Excel and draw the reinforcement
6	Design a simply supported RCC one way slab with intermediate support and draw the reinforcement details

7	Design a two-way slab for the given data and prepare Bar bending schedule 8 Design a short axially loaded RC column using Excel	
8	Design the reinforcement for RCC square column with isolated square footing	
9	Design the reinforcement for RCC circular column with isolated square footing	
10	Creation of models related to RC Structural elements. (Demonstration)	

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:
CO1: Understand the design philosophy and principles (PO – 1,3,8, PSO – 1,2)
CO2: Solve problems of RC elements subjected to flexure, shear and torsion (PO – 1,2,3, PSO – 1,2)
CO3: Demonstrate the procedure in designs of RC structural elements such as slabs, columns and footings. (PO – 1,2,3, PSO – 1,2)
CO4: Owns professional and ethical responsibility. (PO – 1,2,3,8, PSO – 1,2)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are 25 marks and that for the practical component is 25 marks.
- 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and 10 marks for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for 25 marks).
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- 15 marks for the conduction of the experiment and preparation of laboratory record, and 10 marks for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test (duration 02/03 hours) after completion of all the experiments shall be conducted for 50 marks and scaled down to 10 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (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. 3. The students have to answer 5 full questions, selecting one full question from each module. 4. Marks scored by the student shall be proportionally scaled down to 50 Marks The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Text Books:

1. B C Punmia "RCC Design" Laxmi Publications .11th edition
2. N Subramanian, "Design of Concrete Structures", Oxford university Press
3. H J Shah, "Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)", Charotar Publishing House Pvt. Ltd.

Reference Books:

1. P C Varghese, "Limit State design of reinforced concrete", PHI, New Delhi.

2. W H Mosley, R Husle, J H Bungey, "Reinforced Concrete Design", MacMillan Education, Palgrave publishers.
3. Kong and Evans, "Reinforced and Pre-Stressed Concrete", Springer Publications.
4. A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press.
5. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons, Inc.

Web links and Video Lectures (e-Resources):

https://nptel.ac.in/courses/105105105

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
  - Case Study
  - Industrial visit
  - Quiz

<u>CO & PSO - PO Mapping</u> (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes													
Course outcomes	**Program outcomes**											**Program Specific Outcomes**	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1													
CO2													
CO3													
CO4													
CO5													
Total													
Average													

Level 0: Not Mapped, 1: Low Mapped, 2: Moderately Mapped 3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs
Can be identified by the concerned course instructor.

SOFTWARE APPLICATION LAB			
Course Code	**24CVL63**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	0:0:2	**SEE Marks**	50
Credits	01	**Total Marks**	100
Contact Hours	8-10 Slots	**Exam Hours**	3
Examination type (SEE)	Practical		

Prerequisites:

The students should have knowledge on

- Fundamentals of Analysis of Building
- Basic Computer Skills
- Engineering Drawing
- Introduction to Staad Pro Software

Course Objectives:

- Use industry standard software in a professional set up.
- Understand the elements of finite element modelling, specification of loads and boundary condition, performing analysis and interpretation of results for final design.
- Develop customized automation tools

Sl.NO	Experiments
1	Analysis of plane trusses, continuous beams using software
2	Analysis of portal frames using software
3	Understanding basic features of Project management software. 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. Constructing Network diagram (AON Diagram) and analyzing for Critical path
5	Critical activities and Other non-Critical paths, Project duration, Floats. Study on various View options available
6	Basic understanding about Resource Creation and allocation g. Understanding about Splitting the activity, Linking multiple activity, assigning Constrains, Merging Multiple projects, Creating Baseline Project
7	GIS applications using open source software: To create shape files for point, line and polygon features with a map as reference. To create decision maps for specific purpose.

8	Computation of earthwork, Design of horizontal curve by offset method, Design of super elevation Using Excel

Course outcomes (Course Skill Set):

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

CO1: Use software for analysis and design of structural elements (PO – 1,2,3,5 PSO – 1,2)

CO2: Design using excel spread sheet (PO – 1,2,5, PSO – 1,2)

CO3: Basic features of Project management software (PO – 1,5, PSO – 1,2)

Assessment Details (both CIE and SEE) :

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are 50 Marks.

The split-up of CIE marks for record/ journal and test are in the ratio 60:40.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to 20 marks (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the

student.

Semester-End Examination:

SEE marks for the practical course are 50 Marks.

- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. OR based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.
- General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)
- Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero. The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- Training manuals and User manuals and Relevant course reference books

ALTERNATE BUILDING MATERIALS			
Course Code	**24CV64A**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Basic knowledge of Building Materials and Construction.
- Understanding of the properties and applications of conventional construction materials.
- Familiarity with sustainable construction practices and environmental concerns
- Understanding of fundamental Civil Engineering concepts related to construction and infrastructure.

Course Objectives:

- Understand environmental issues due to building materials and the energy consumption in manufacturing building materials
- Study the various masonry blocks, masonry mortar and structural behavior of masonry under compression.
- Study the alternative building materials in the present context.
- Understand the alternative building technologies which are followed in present construction field.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **8 Hours**

Environmental Implications of Buildings Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings. Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

Text Book: Chapter-1:1.1 to 1.8 Chapter: 2.1 to 2.6

Module-2 **8 Hours**

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.

Text Book: Chapter-5: 5.1 to 5.6

Module-3 **8 Hours**

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.

Text Book: Chapter-3: 3.1 to 3.8

Module-4 **8 Hours**

Alternate Building Technologies: Use of arches in foundation, alternatives for wall constructions, composite masonry, confined masonry, cavity walls, rammed earth, Ferro cement and ferroconcrete 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.

Text Book: Chapter-7:7.1 to 7.10

Module-5 **8 Hours**

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.

Text Book: Chapter-7: 7.3,7.6,.7 Chapter-17: 17.1 to 17.7

Course outcomes (Course Skill Set):

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

CO1: Solve the problems of Environmental issues concerned to building materials and cost-effective building technologies' (PO – 1,2,3,7,11 PSO – 1,2)

CO2: Select appropriate type of masonry unit and mortar for civil engineering constructions; also, they are able to Design Structural Masonry Elements under Axial Compression. (PO – 1,2,3,7,11 PSO – 1,2)

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. (PO – 1,2,3,7,11 PSO – 1,2)

CO4: Recommend various types of alternative building materials and technologies and design an energy efficient building by considering local climatic condition and building material. (PO – 1,2,3,7,11 PSO – 1,2)

CO5: Select appropriate type of Equipment for Production of Alternate Materials and cost analysis (PO – 12,3,7,11 PSO – 1,2)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks.

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Suggested Learning Resources:

Textbook:

1.KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, "Alternative Building Materials and Technologies", New Age International pub.

Reference Books:

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.

Web links and Video Lectures(e-Resources):

- Online study material
- NPTEL video lectures

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
  - Case Study
  - Programming Assignment
  - Gate Based Aptitude Test

MOOC Assignment for selected Module

DESIGN AND CONSTRUCTION OF HIGHWAY PAVEMENTS			
Course Code	**24CV64B**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites: The students should have knowledge on

- Fundamentals of Strength of Materials
- Basic understanding of Geotechnical Engineering
- Introduction to Transportation Engineering

Course objectives:

- To impart a fundamental understanding to the basics of highway geometric design features
- To introduce the evaluation of pavement material characteristics to identify their suitability for construction
- To study the principles and design of flexible and rigid pavements according to IRC specifications
- To skill up for executing pavement construction with quality control and assurance along with Plants and Machinery selection

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **8 Hours**

Introduction and Subgrade Materials: Overview of highway - Classification of roads, Pavement Layers – Components and Functions, Highway alignment and Survey, road development in India, Components and Geometric Standards of Highway Design

Pavement subgrade material: Soils, Soil Characteristic Evaluation, desirable properties, tests (Virtual) - Liquid Limit, Plastic limit, Shrinkage Limit, Grain size analysis - Wet sieve and Hydrometer analysis, Water Content, Specific gravity, Free swell index, Relative density, Heavy compaction, California Bearing Ratio.

Text Book: Chapter-1,2,3,4,5

Module-2 **8 Hours**

Pavement Materials Stone aggregates: Desirable properties, tests (Virtual) - Sieve analysis, Specific gravity, Water absorption, Bulk density, Wet Sieve analysis, Aggregate crushing value, Aggregate impact value, Combined Flakiness and Elongation index, Aggregate abrasion value, Soundness of aggregate, Characteristic evaluation.

Bituminous binders: Desirable properties, tests (Virtual) - Specific gravity, Penetration, Softening Point, Ductility, Elastic recovery, Flash point, Separation, Loss on heating, Matter soluble in trichloro ethylene, Absolute, Kinematic and Rotational Viscosity, Aging of Bitumen, Characteristic evaluation.

Bituminous paving mix: Desirable properties, tests (Virtual) - Stripping value of coarse aggregate, Stone polishing value of coarse aggregate, Maximum specific gravity of bituminous mix, Marshall stability & flow, Binder content, Bulk specific gravity and density, Indirect tensile strength, Resilient Modulus (indirect tension test), Resistance of compacted asphalt mixtures to moisture-induced damage, Characteristic evaluation

Cement: Desirable properties, tests (Virtual) - Consistency, Initial Setting Time, Final Setting Time, Mortar Cube compressive strength, Fineness of cement, Specific gravity of cement, Soundness of cement, Characteristic evaluation

Concrete: Desirable properties, requirements, tests (Virtual) - Workability, Compressive Strength, Flexural strength, Characteristic evaluation

Text Book: Chapter- 6

Module-3 **8 Hours**

Principles and Design of Pavements

Flexible Pavement: Introduction, composition, factors governing design, design of flexible pavements as per IRC; Bituminous mix design (Marshall method), IIT Pave Software; Case study - Design Problem
Rigid pavement: Introduction, composition, factors governing design, DLC and PQC mix design; design of concrete pavements as per IRC; Joints; Case study – Design Problem

Text Book: Chapter- 7

Module-4 **8 Hours**

Plants and Machinery: Introduction; Asphalt Hot Mix Plant, Concrete Batching Plant, Wet Mix Macadam Plant, Earthmoving and Excavation Equipment, Paving Equipment, Slipform Paver, Paver Milling and Road Marking Equipment; Factors affecting output of Plant & Equipment; Initiatives to improve quality

Construction Planning: Concept of Highways, Planning; Schedules in Planning; Monitoring; Software in Planning

Text Book: Chapter- 8

Module-5 **8 Hours**

Subgrade and Base Layer: Construction Practices and Quality Control; Granular Sub-base Construction Activities; Cement Treated Sub-base Construction Activities

Flexible Layers: Wet Mix Macadam; Construction Practices of Wet Mix Macadam; Hot Mix Asphalt; Construction Practices of Hot Mix Asphalt Layer, Quality Control of Flexible Layers

Rigid Layers: Dry Lean Concrete; Construction Practices of Dry Lean Concrete; Pavement Quality Concrete; Construction Practices of Pavement Quality Concrete, Quality Control of Rigid Layers **Pavement Evaluation:** Introduction, Pavement Condition Survey, Pavement Evaluation Functional and Structural, Distresses - Flexible and Rigid Pavement, Overlay Design of Flexible Pavement.

Text Book: Chapter- 8

Course outcomes (Course Skill Set):
At the end of the course, the student will be able to:

CO1: Develop an understanding of the fundamentals of pavement layer behavior (PO – 1,2,3, PSO – 1,2)
CO2: Comprehend the material specifications by interpreting the relationship between material properties and pavement behaviour. (PO – 1,2,3, PSO – 1,2)
CO3: Conduct different tests on road construction materials to evaluate their characteristics (PO – 1,2,3, PSO – 1,2)
CO4: Carry out the design of flexible and rigid pavements (PO – 1,2,3, PSO – 1,2)
CO5: Acquire skilful knowledge of pavement construction practices, plant and machinery selection and quality control. (PO – 1,2,3, PSO – 1,2)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)

• The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Textbook:

1. S. K. Khanna and C. E. G. Justo, "Highway Engineering," Nem Chand & Bros, Roorkee, 2001

Reference Books:

1. Kadiyali L. R., Lal N. B. (2013). Principles and practices of highway engineering. New Delhi: Khanna Publishers.
2. Yoder, E.J. and Witczak, M.W. (1975) Principle of Pavement Design. 2nd Edition, John Wiley & Sons, Hoboken, http://dx.doi.org/10.1002/9780470172919
3. Pavement Design, Universities Press, 2012 R. Srinivasa Kumar, Transportation Engineering, Universities Press, 2018 75

Web links and Video Lectures(e-Resources):

- https://nptel.ac.in/courses/105104098
- http://www.gpcet.ac.in/wp-content/uploads/2017/04/TE-I-Unit-V-LEcture-Notes.pdf
- https://www.civil.iitb.ac.in/tvm/1100_LnTse/401_lnTse/plain/plain.html
- https://theconstructor.org/transportation/factors-affecting-pavement-design/12849/

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
  - Case Study
  - Programming Assignment
  - Gate Based Aptitude Test
  - MOOC Assignment for selected Module

APPLIED GEOTECHNICAL ENGINEERING			
Course Code	**24CV64C**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Course Objectives:

- Appreciate basic concepts of soil mechanics applied in the design of foundations
- Learn concepts of Geotechnical investigations required for civil engineering projects emphasizing in situ investigations.
- Conceptually learn various theories related to bearing capacity of soil and their application in the design of shallow foundations and estimation of load carrying capacity of pile foundation.
- Estimate internal stresses in the soil mass and application of this knowledge in proportioning of shallow and deep foundation fulfilling settlement criteria
- Study about assessing stability of slopes and earth pressure on rigid retaining structures

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **8 Hours**

Soil Exploration:

Introduction, Objectives and Importance, Stages and Methods of exploration- Test pits, Borings, stabilization of boreholes, Sampling techniques, Undisturbed, disturbed and representative samples, sample disturbance and Bore hole log.

Text Book: Chapter-32: 32.1 to 32.9

Module-2 **8 Hours**

Drainage and Dewatering:

Drainage and Dewatering methods, estimation of depth of GWT (Hvorslev's method)

Flownets: Importance, properties and applications, Phreatic Lines, Seepage in earth dams (with and without)

Text Book: Chapter-11: 11.1 to 11.9

Module-3 **8 Hours**

Lateral Earth Pressure:

Active, Passive and earth pressure at rest, Rankine's theory for cohesionless and cohesive soils, Factors influencing lateral earth pressure, Geotechnical design of gravity and cantilever retaining walls.
Text Book: Chapter-20: 20.1 to 20.13

Module-4 **8 Hours**

Stability of Slopes:
Assumptions, infinite and finite slopes, factor of safety, Swedish slip circle method for C and C-ø (Method of slices) soils, Fellineous method for critical slip circle, use of Taylor's stability charts. Causes for slope instability, Methods of stabilisation of slopes
Text Book: Chapter-23: 23.1 to 23.10

Module-5 **8 Hours**

Stresses in Soil:
Geodesic stress and Stress due to structures, Boussinesq's Stress distribution in ground for point load, line load and uniformly distributed loads, Newmark's Chart, Contact Pressure, Pressure bulbs. Types of settlements and importance, Computation of immediate and consolidation settlement, permissible differential and total settlements (IS 8009 part 1).
Text Book Chapter-13: 13.1 to 13.12

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:
CO1: Ability to plan and execute geotechnical site investigation program for different civil engineering projects (PO – 1,2,3, PSO – 1,2)
CO2: Ability to understand Drainage and Dewatering methods and seepage of water (PO – 1,2,3, PSO – 1,2)
CO3: Ability to compute lateral pressure distribution behind earth retaining structures. (PO – 1,2,3, PSO – 1,2)
CO4: Ability to estimate factor of safety against failure of slopes. (PO – 1,2,3, PSO – 1,2)
CO5: Understanding of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils. (PO – 1,2,3, PSO – 1,2)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Textbook:

1. Punmia, B.C. (2004) Soil Mechanics and Foundations. 13th Edition, Laxmi Publications (P) Ltd.

Reference Books:

1. Seymour Lipschutz, D Murthy, V.N.S. (2002) Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering. Marcel Dekker Inc., New York.
2. Bowles, J.E. (2001) Foundation Analysis and Design. 5th Edition, McGraw-Hill, New York.
3. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics, New Age International (P) Ltd., New Delhi. 2016
4. Braja, M. Das, Geotechnical Engineering; Thomson Business Information India (P) Ltd., India. 2015

Web links and Video Lectures(e-Resources):

- https://nptel.ac.in/courses/105105039/2
- https://www.youtube.com/watch?v=Jy6lt6OTwaU

- https://www.youtube.com/watch?v=xUWqEA4CfZo
- https://nptel.ac.in/courses/105103097/24
- https://nptel.ac.in/courses/105103097/20
- https://nptel.ac.in/courses/105104137/module6/lecture20.pdf
- https://www.youtube.com/watch?v=gxsKH5zRWVI
- https://www.youtube.com/watch?v=YEltCJUZ0hk
- https://nptel.ac.in/courses/105105039/7
- https://www.youtube.com/watch?v=eqwT2hy29hk
- https://www.youtube.com/watch?v=eqwT2hy29hk

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
    - Case Study
    - Programming Assignment
    - Gate Based Aptitude Test
    - MOOC Assignment for selected Module

WATER CONSERVATION AND RAIN WATER HARVESTING

Course Code	**24CV65A**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	03
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Technical and Site Prerequisites
- Essential System Components
- Community and Usage Prerequisites
- Conservation Practices

Course Learning objectives:

This course will enable students to

- Appreciate basic concepts of Water and its importance.
- Learn elementary knowledge of ground water.
- Conceptually learn various theories related to Groundwater recharge and Groundwater recharge
- Study about Subsurface investigation of Ground water.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **8 Hours**

Water and its importance

Monsoon— types and behavior in India, rainfall — characteristics and distribution, onset and withdrawal of effective rains, dry spells and wet spells, critical dry spells, water loss from the soil, measurement and factors, hydrological cycle, Importance and issues relating water status Scenario of water in Karnataka: sources, geographical distribution, quality. Water (hydrological) cycle, influence of human activity on the water cycle, Surface water resources.

Text Book:1 Chapter 1: 1.1 to 1.7 Chapter 3 : 3.1. to 3.6 **L1, L2**

Module-2	8 Hours
Elementary knowledge of ground water General aquifer. Water quality and its impact on human beings. Water harvesting: need, principles of water harvesting, general water harvesting methods - rain water harvesting - methods, classes, benefits, approach, rooftop rainwater harvesting , subsurface barrier/dykes, farm ponding, etc mostly used in rural areas **L1, L2** **Text Book:1** Chapter 5: 5.1 to 5.4 Chapter 6: 6.1 to 6.9	
Module-3	**8 Hours**
Groundwater recharge Factors affecting groundwater recharge, Revival of traditional techniques for water harvesting. Calculation of available rain water for harvesting. Preparation of suitable technical drawing and design of rain water harvesting structure **L1, L2** **Text Book**:1 Chapter 8.1 to 8.6	
Module-4	**8 Hours**
Elementary conservation of water Importance, knowledge regarding conservation/saving of water in daily use, in agriculture, in industries. Water Conservation strategies- Limiting the consumption, Reuse and recycling, Elimination of losses, Pollution prevention **L1, L2, L3, L4** **Text Book:1** Chapter 11: 11.1 to 11.6	
Module-5	**8 Hours**
Subsurface investigation of Ground water General, geophysical methods and its importance. Present law regarding water management Water footprints- blue water footprint, green water footprint, grey water footprint. Sustainability assessment **L1, L2** **Text Book: 1** Chapter 12: 12.1 to 12.7	

Course outcome (Course Skill Set):

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

CO1: Understand the significance of Water, its issues and current status (PO – 1,2 3, PSO -1,2)

CO2: Aquire knowledge on principles of water harvesting and challenges (PO – 1,2,3 PSO -1,2)

CO3: Calculate and prepare design rain water harvesting structures (PO – 1,2,3 PSO -1,2)

CO4: Importance and Knowledge regarding conservation and saving water in daily use, agriculture and industry (PO – 1,2,3 PSO -1,2)

CO5: Identify various Geophysical methods, water management laws and sustainability assessment process (PO – 1,2,3 PSO -1,2)

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Textbook:

1. Ground water Hydrology, David K Todd & Larry W Maya, Edition 1980, Wiley India Specifications

Reference Books:

1. Hydrology, HM Ranganath, Fourth edition 1990, New age publications.
2. Rain water Harvesting, P K Singh, and second edition 2009, Macaillan India ltd.
3. Ground water Prospecting & Management, H P Patra, Second edition 2010, Springer publication.

Web links and Video Lectures (e-Resources):

- https://byjus.com/chemistry/importance-of-water
- https://www.slideshare.net/slideshow/elementary-knowledge-of-ground-water-rwh/276806354
- https://www.rainyfilters.com/about-us/blogs/ground-water-recharge
- https://www.natgeokids.com/uk/primary-resource/water-conservation-primary-resource/
- https://www.slideshare.net/slideshow/subsurface-investigation-of-groundwater/232346996

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

- Seminars /Quiz (to assist in GATE preparations)
- Demonstrations in using Softwares
- Self-Study on simple topics
- Simple problems solving by Etabs/Staad pro.

CO & PSO - PO Mapping (Individual Teacher has to fill)

Mapping of Course Outcomes and Program specific outcomes to Program Outcomes														
Course outcomes	Program outcomes												Program Specific Outcomes	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	1	1	1	1	2	2					2	1
CO2	3	2	1	1	1	1	2	2					2	1
CO3	3	2	1	2	1	1	2	2					2	1
CO4	3	2	1	2	1	1	2	2					2	1
CO5	3	2	1	2	1	1	2	2					2	1
Total														
Average														

Level 0: Not Mapped,1: Low Mapped, 2: Moderately Mapped3: Highly Mapped

Note: Depending on the Assessment tool used, higher order POs Can be identified by the concerned course instructor.

GEOGRAPHIC INFORMATION SYSTEM			
Course Code	**24CV65B**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Basic of Data Management
- Understanding of Basics of GIS

Course Objectives:

- To introduce the fundamentals and components of Geographic Information System.
- To provide details of spatial data structures and input, management and output processes.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **8 Hours**

Fundamentals of GIS: Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions– History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements

Text Book: Chapter-1:1 to 1.7

Module-2 **8 Hours**

Spatial Data Models; Database Structures – Relational, Object Oriented – Entities – ER diagram - data models - conceptual, logical and physical models - spatial data models – Raster Data Structure **Text Book**: Chapter-2: 2.1 to 2.5

Module-3 **8 Hours**

Data Input and Topology: Scanner - Raster Data Input – Raster Data File Formats – Georeferencing – Vector Data Input –Digitiser – Datum Projection and reprojection -Coordinate Transformation – Topology - Adjacency, connectivity and containment – Topological Consistency

Text Book: Chapter-3: 3.1 to 3.5

Module-4 **8 Hours**

Data Quality and Standards: Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards –Interoperability - OGC - Spatial Data Infrastructure.
Text Book: Chapter-5: 5.1 to 5.4

Module-5 **8 Hours**

Data Management and Output: Import/Export – Data Management functions- Raster to Vector and Vector to Raster Conversion - Data Output - Map Compilation – Chart/Graphs – Multimedia – Enterprise Vs. Desktop GIS distributed GIS.
Text Book Chapter-6: 6.1 to 6.4

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:
CO1: Have basic idea about the fundamentals of GIS. (PO – 1,5, PSO – 1,3)
CO2: Understand the types of data models (PO – 1,5 PSO – 1,3)
CO3: Get knowledge about data input and topology. (PO – 1,5 PSO – 1,3)
CO4: Gain knowledge on data quality and standards. (PO – 1,5 PSO – 1,3)
CO5: Understand data management functions and data output. (PO – 1,5 PSO – 1,3)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Textbook:

1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011.

Reference Books:

1. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction Geographical Information Systems, Pearson Education, 2nd Edition,2007.
2. Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006

Web links and Video Lectures(e-Resources):

- https://elearning.iirs.gov.in/
- https://www.iirs.gov.in/

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
    - Case study
    - Visit to KSRSAC and ISRO

SUSTAINABLE DEVELOPMENT GOALS			
Course Code	**24CV65C**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Basic of Sustainability
- Understanding of Climate Change
- Basic knowledge on Biodiversity

Course Objectives:

- To introduce the fundamentals and components of Sustainable Development
- To provide details of Sustainable Cities
- Understand the Sustainable Development Goals.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1	**8 Hours**

Sustainable Development: Introduction to Sustainable Development Economic Growth and Progress, Continuing Poverty, Environmental Threats, Business as Usual Versus Sustainable Development
Text Book: Chapter-1: Part 1 & 2

Module-2	**8 Hours**

Sustainable Cities: The Patterns of Urbanization Around the World, development of Sustainable city, Smart Infrastructure, Urban Resilience, Planning for Sustainable Development.
Text Book: Chapter-1: Part 1,2 & 4

Module-3	**8 Hours**

Curbing Climate Change the Basic Science of Climate Change, Consequences, Mitigation, Adaptation, Mitigation Policies
Text Book : Chapter-1: Part 1 & 2

Module-4	**8 Hours**

Saving Biodiversity: Concept of Biodiversity, Biodiversity Under Threat, Oceans and Fisheries, Deforestation International Dynamics.
Text Book: Chapter-1: Part 1 & 2

Module-5 **8 Hours**

Sustainable Development Goals Introduction to Sustainable Development Goals, Goal-Based Development, Financing for Sustainable Development, Principles of Good Governance, Feasibility of Sustainable Development.
Text Book : : Chapter-1: Part 1 & 2

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:
CO1: Understand basic idea about Sustainable Development. (PO – 1,7, PSO – 1,3)
CO2: Get knowledge about Sustainable Cities. (PO – 1,7 PSO – 1,3)
CO3: Gain knowledge on Saving Biodiversity. (PO – 1,7 PSO – 1,3)
CO4: Understand Sustainable Development Goals. (PO – 1,7 PSO – 1,3)

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Textbook:

1. Ram Kumar Mishra, Ch Lakshmi Kumari, Sandeep Chachra, P.S. Janaki Krishna "Smart Cities for Sustainable Development" Springer, 2022 Edition

Reference Books:

1. The Sustainable Development Goals Report 2020 Kindle Edition, Department of Economic and Social Affairs
2. 'The Sustainable Development Goals" Hardcover – December 4, 2018 United Nations.

Web links and Video Lectures(e-Resources):

- https://www.youtube.com/results?search_query=sustainable+development+goals
- https://www.youtube.com/watch?v=qAIolKgDPrA
- https://nptel.ac.in/courses/109105190
- https://www.youtube.com/watch?v=v-Afm04x2Ow

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
    - Case Study
    - MOOC Assignment for selected Module

RESEARCH METHODOLOGY & IPR			
Course Code	**24RM66**	**CIE Marks**	50
Teaching Hours/Week (L: T: P)	3:0:0	**SEE Marks**	50
Credits	03	**Total Marks**	100
Contact Hours	40	**Exam Hours**	3
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- A fundamental knowledge of research ethics
- Understanding of key academic, scientific, and technical principles.
- Core requirements of a research problem, mastering literature review, designing experiments, data analysis,
- Understanding patenting and IP protection.

Course Objectives:

- To Understand the knowledge on basics of research and its types.
- To Learn the concept of Literature Review, Technical Reading, Attributions and Citations.
- To learn Ethics in Engineering Research.
- To Discuss the concepts of Intellectual Property Rights in engineering.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

1. Chalk and Talk with Black Board
2. ICT based Teaching
3. Demonstration based Teaching

Module-1 **5 Hours**

Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research, Finding and Solving a Worthwhile Problem. Ethics in Engineering Research, Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship.

Text Book: Chapter-1:1.2 Chapter-2: 2.1 to 2.7

Module-2 **5 Hours**

Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading, Taking Notes While Reading, Reading Mathematics and Algorithms, Reading a Datasheet. Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions, What Should Be Acknowledged, Acknowledgments in, Books Dissertations, Dedication or Acknowledgments.

Text Book: **Chapter-3: 3.1,3.2,3.6 3.3, 3.4, 3.7**

Module-3 **5 Hours**

Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP History of IP in India. Major Amendments in IP Laws and Acts in India.

Patents: Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Avoid Public Disclosure of an Invention before Patenting. Process of Patenting. Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models.

Process of Patenting. Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Commercialization of a Patent. Need for a Patent Attorney/Agent. Can a Worldwide Patent be Obtained. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications. Commonly Used Terms in Patenting. National Bodies Dealing with Patent Affairs. Utility Models.

Text Book: Chapter-4: 4.1 to 4.4 4.5,4.7,4.8

Module-4 5 Hours

Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Fair Use Doctrine. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). International Copyright Agreements, Conventions and Treaties. Interesting Copyrights Cases. Trademarks: Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. Prior Art Search. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.

Text Book: Chapter-5: 5.1 to 5.3, 5.5 ,5.7 to 5.11

Module-5 5 Hours

Industrial Designs: Eligibility Criteria. Acts and Laws to Govern Industrial Designs. Design Rights. Enforcement of Design Rights. Non-Protectable Industrial Designs India. Protection Term. Procedure for Registration of Industrial Designs. Prior Art Search. Application for Registration. Duration of the Registration of a Design. Importance of Design Registration. Cancellation of the Registered Design. Application Forms. Classification of Industrial Designs. Designs Registration Trend in India. International Treaties. Famous Case Law: Apple Inc. vs. Samsung Electronics Co.

Module-5	5 Hours
Geographical Indications: Acts, Laws and Rules Pertaining to GI. Ownership of GI. Rights Granted to the Holders. Registered GI in India. Identification of Registered GI. Classes of GI. Non-Registerable GI. Protection of GI. Collective or Certification Marks. Enforcement of GI Rights. Procedure for GI Registration Documents Required for GI Registration. GI Ecosystem in India. **Case Studies on Patents:** Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, Case study of Basmati patent. IP Organizations In India. Schemes and Programmes **Text Book Chapter-6: 6.1, 6.2 Chapter 8: 8.1 to 8.3**	

Course outcomes (Course Skill Set):

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

CO 1. To know the meaning of engineering research.

CO 2. To know the procedure of Literature Review and Technical Reading.

CO 3. To know the fundamentals of patent laws and drafting procedure.

CO 4. Understanding the copyright laws and subject matters of copyrights and designs

CO 5. Understanding the basic principles of design rights.

Assessment Details (both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student 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.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.

- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks.
- Any two assignment methods mentioned in the regulations; if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (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.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Textbook

1. Dipankar Deb • Rajeeb Dey, Valentina E. Balas "Engineering Research Methodology", ISSN 1868-4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13- 2946-3 ISBN 978-981-13-2947-0 (eBook), https://doi.org/10.1007/978-981-13-2947-0
2. Intellectual Property A Primer for Academia by Prof. Rupinder Tewari Ms. Mamta Bhardwa

Reference Book:

1. David V. Thiel "Research Methods for Engineers" Cambridge University Press, 978-1-107-03488- 4
2. Intellectual Property Rights by N.K.Acharya Asia Law House 6th Edition. ISBN: 978-93-81849-30-9

Web links and Video Lectures(e-Resources):

- http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html
- https://nptel.ac.in/courses/106/105/106105171/
- http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
- https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s
- https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html
- https://nptel.ac.in/courses/106/102/106102064/
- https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html
- https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html
- https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html
- https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html
- https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first-traversal/dft-practice.html
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013501595428077568125 59/overview

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

- Role Play
- Flipped classroom
- Assessment Methods for 25 Marks (opt two Learning Activities)
    - Case Study
    - Programming Assignment
    - Gate Based Aptitude Test
    - MOOC Assignment for selected Module

MINI PROJECT			
Course Code	**24CVP67**	**CIE Marks**	100
Teaching Hours/Week (L: T: P)	0:0:4	**SEE Marks**	-
Credits	02	**Total Marks**	100
Contact Hours	-	**Exam Hours**	-
Examination type (SEE)	-		

Prerequisites:

Nil

Course Contents

Guidelines:

In order to address challenges within the realm of cutting-edge technologies, students are required to collaborate in groups of three or four. Each group focuses on solving a problem within a specific domain. To provide guidance and oversight of project advancement, an Internal Guide is assigned to each batch. These guides possess expertise in the relevant domain. Should the need arise, the Internal Guide is capable of organizing clarification sessions to address any uncertainties raised by the students working on the project. These interactions are duly documented for future reference.

Relevance of Project:

Students are expected to articulate the significance of their project within the current IT landscape and broader society.

Literature Survey:

Students must conduct a thorough review of research articles and existing projects to pinpoint gaps within the identified problem statement.

Design:

Students are required to formulate a comprehensive design document encompassing class, use case, component diagrams, state models, sequence models, activity diagrams, and interaction models.

Implementation:

Students should execute the designed model using appropriate techniques.

Presentation:

Regularly, students are to present their progress to the evaluation committee. The committee evaluates

based on the quality of the presentation, depth of content coverage, adeptness in addressing raised questions, and the evident division of teamwork. Scores are determined within this criterion for individual students.

Report:

Each group must compose a project report and submit it to the department. Reports are expected to adhere to the standardized format set by the department.

Course outcomes (Course Skill Set):

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

CO1: Conduct a systematic literature review to synthesize current knowledge, identify gaps, and justify a focused problem statement in the chosen AIML area. (PO - 1,11, PSO - 1, 2, 3)

CO2: Formulate specific objectives and select appropriate methods/tools (e.g., theoretical analysis, simulations, model development, hardware/edge deployment) aligned to the problem context. (PO – 8,9,10,11, PSO – 1,2,3)

CO3: Design and implement a working solution (code/simulation/prototype), following sound engineering practices, reproducible workflows, and version control. (PO – 1,2,3,4,5,6,7,8,9,10,11, PSO – 1,2,3)

CO4: Plan tasks and milestones; maintain a professional journal/progress reports that evidence work completed, decisions taken, and a schedule for remaining tasks within the allotted timeline. (PO – 1,2,3,4,5,6,7,8,9,10,11, PSO – 1,2,3)

CO5: Deliver a structured technical presentation demonstrating individual contributions, and produce a formal report that clearly documents methodology, results, and conclusions. (PO – 1,2,4,8,9,10,11, PSO – 1,2,3)

Assessment Details (CIE):

The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the project report, project presentation skill, and question and answer session in the ratio of 50:25:25.

INDIAN KNOWLEDGE SYSTEMS			
Course Code	**24IKS69**	**CIE Marks**	100
Teaching Hours/Week (L: T: P)	1:0:0	**SEE Marks**	-
Credits	0	**Total Marks**	100
Contact Hours	15	**Exam Hours**	-
Examination type (SEE)	Theory		

Prerequisites:

The students should have knowledge on

- Basic awareness of Indian history, culture, and civilization.
- Interest in understanding India's traditional knowledge and heritage.
- Openness to interdisciplinary learning and critical thinking.

Course Objectives:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system
- To make the students understand the traditional knowledge and analyse it and apply it to their day-to-day life.

Teaching-Learning Process (General Instructions)

Teachers can use following strategies to accelerate the attainment of the various course outcomes.

a. Chalk and Talk with Black Board
b. ICT based Teaching
c. Demonstration based Teaching

Module-1	**5 Hours**

Introduction to Indian Knowledge Systems (IKS): Overview, Vedic Corpus, Philosophy, Character scope and importance, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge

Module-2	**5 Hours**

Traditional Knowledge in Humanities and Sciences: Lingistics, Number and measurements- Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology.

Module-3	**5 Hours**

Traditional Knowledge in Professional domain: Town planning and architecture Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals.

Course outcomes (Course Skill Set):

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

CO1: Provide an overview of the concept of the Indian Knowledge System and its importance.
CO2: Appreciate the need and importance of protecting traditional knowledge.
CO3: Recognize the relevance of Traditional knowledge in different domains.
CO4: Establish the significance of Indian Knowledge systems in the contemporary world.

Assessment and Evaluation Pattern

QUIZZES- 20 Marks

Quiz-I
Quiz-II
Each quiz is evaluated for 10 marks adding up to 20 Marks.

THEORY COURSE - (Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating)

Test -40 Marks

Test – I

Test – II

Each test will be conducted for 25 Marks adding upto 50 marks.
Final test marks will be reduced to 40 Marks

EXPERIENTIAL LEARNING 40 Marks

Case Study-based Teaching-Learning -- Sector wise study & consolidation (viz., Engg. Semiconductor Design, Healthcare & Pharmaceutical, FMCG, Automobile, Aerospace and IT/ ITeS) -- Video based seminar (4-5 minutes per student) –

Maximum Marks for the Theory ---
Practical –

Total Marks for the Course 100

Reference Book:

1. Introduction to Indian Knowledge System- concepts and applications, B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R N, 2022, PHI Learning Private Ltd, ISBN-978-93- 91818-21

2. Traditional Knowledge System in India, Amit Jha, 2009, Atlantic Publishers and Distributors (P) Ltd., ISBN-13: 978-8126912230,
3. Knowledge Traditions and Practices of India, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334,

Web Links:

https://www.youtube.com/watch?v=LZP1StpYEPM
http://nptel.ac.in/courses/121106003/
https://www.wipo.int/pressroom/en/briefs/tk_ip.html
http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf
https://unfoundation.org/what-we-do/issues/sustainable-development-goals/?gclid=EAIaIQobChMInp-Jtb_p8gIVTeN3Ch27LAmPEAAYASAAEgIm1vD_BwE