MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

# Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru–560074


# Civil Engineering

## Bachelor of Engineering (B.E)

Scheme and Syllabus of III & IV Semester

(2024 Scheme)

# VISION

To empower young minds through technology, research and innovation, to produce technically competent and socially responsible professionals in higher education.

# MISSION

1. To deliver excellence in education through innovative teaching, impactful research, and continuous skill development, preparing students to meet global challenges with technical expertise and ethical responsibility.
2. To foster a transformative learning environment that integrates technology, research and practical experience, empowering students to become skilled professionals and socially conscious leaders.
3. To cultivate a culture of lifelong learning and professional excellence by encouraging creativity, research, and community engagement, equipping students with the skills to thrive in a dynamic world.
4. To provide a holistic educational experience that combines advanced technology, hands-on research, and community-focused learning, shaping students into competent, ethical professionals who contribute positively to society.

# QUALITY POLICY

Rajarajeswari College of Engineering is committed to imparting quality technical education that nurtures competent, ethical professionals with global relevance. We ensure academic excellence through a dynamic, outcome-based curriculum, experienced faculty, and cutting-edge infrastructure. Continuous improvement is driven by innovation, research and strong industry collaboration. We foster holistic development and a progressive environment that supports lifelong learning, teamwork, and professional growth.

# CORE VALUES

Academic Excellence, Integrity, Innovation, Global Competence, Continuous Improvement.

# Civil Engineering

## DEPARTMENT VISION

To initiate graduate and research programmes in civil engineering for the country's long-term growth and sustainable development.

## DEPARTMENT MISSION

1. To generate high skilled civil engineers with moral principles who can benefit society.
2. Transforming the department into a premier hub for civil engineer and allied research.
3. To offer community support in all facets of civil engineering and provide consultancy services.
4. To encourage young engineers to think creative and innovative to meet potential challenges in the civil engineering career

# PROGRAM OUTCOMES (POs)

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

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

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

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

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

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

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

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

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

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

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

# PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO1:** Demonstrate proficiency in applying fundamental mathematical, scientific and engineering principles in identifying, formulating, analyzing and solving civil engineering problems.

**PEO2:** To achieve expertise in design and analysis of various civil engineering structures.

**PEO3:** Exhibit professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in lifelong learning.

# PROGRAM SPECIFIC OUTCOMES (PSOs)

**PSO1: Competence in Civil Engineering:** Educating students with fundamental mathematical, scientific, and Engineering knowledge to have a significant and positive long-term impact on the field of civil engineering.

**PSO2: Usage of Cutting Edge Technology:** Inspiring students and preparing them for successful professional careers using appropriate techniques, resources and modern attitudes and modeling to complex engineering activities with practical knowledge and research exposure.

**PSO3: Continuous improvement:** Motivate students in learning to learn and the ability to keep learning for a lifetime to increase their professionalism, update and deepen their knowledge through the development of the profession.

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# Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)

## Department of Civil Engineering

Scheme of Teaching and Examinations : 2024

**(Effective from the Academic Year 2025-26)**

## Semester: III

| S. No | Course Category and Course Code | | Course Title | TD / PSB | Teaching Hours / Week & Credits | | | | | Examination | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture | Tutorial | Practical | SDA | Credits | CIE Marks | SEE Duration Hrs | SEE Marks | Total Marks |
| | | | | | L | T | P | S | | | | | |
| 1. | BSC | B24MZ301 | Mathematics – III (Common to R&A, CV) | Maths | **3** | **0** | **0** | **0** | **3** | **50** | **3** | **50** | **100** |
| 2. | PCC | B24CV302 | Strength of Materials | CV | **3** | **0** | **0** | **0** | **3** | **50** | **3** | **50** | **100** |
| 3. | IPCC | B24CV303 | Surveying | CV | **3** | **0** | **2** | **0** | **4** | **50** | **3** | **50** | **100** |
| 4. | IPCC | B24CV304 | Earth Science for Engineers | CV | **3** | **0** | **2** | **0** | **4** | **50** | **3** | **50** | **100** |
| 5. | PCCL | B24CV305L | Building Materials LAB | CV | **0** | **0** | **2** | **0** | **1** | **50** | **3** | **50** | **100** |
| 6. | ESC | B24CV 36X | ESC/ETC/PLC - III | CV | **3** | **0** | **0** | **0** | **3** | **50** | **3** | **50** | **100** |
| 7. | UHV | B24SCV307 | Social Connect and Responsibility | Any Dept. | **0** | **0** | **2** | **0** | **1** | **50** | **3** | **50** | **100** |
| 8. | AEC/ SEC | B24CV38X | Ability Enhancement Course / Skill Enhancement Course – III (Theory/Lab) | CV | **1**<br>**0** | **0**<br>**0** | **0**<br>**2** | **0** | **1** | **50** | **1**<br>**3** | **50** | **100** |
| 9. | NCMC | B24NCK39X | National Service Scheme / National Cadet Corps / Physical Education / Yoga / Music | HSMC | **1** | **0** | **0** | | **PP** | **50** | | **-** | **50** |
| | | | | | | | | **TOTAL** | **20** | **450** | | **400** | **850** |

BSC: Basic Science Course, HSMC: Humanity, Social sciences including Management courses, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, NCMC: Non-Credit Mandatory Course, AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course L: Lecture, T: Tutorial, P: Practical S:SDA-Skill Development Activity, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation, PP/NP: Pass/Not Pass, YY: Programme Code (EC, CS, IS etc), X: 1/2/3/4**,** K: Indicates Common Course to all the streams of Engineering

| **Engineering Science Course /Emerging Technology Course / Programming Language Course (ESC/ETC/PLC) - III** | | | |
|---|---|---|---|
| B24CV 361 | Building Materials and Construction | B24CV 362 | Geospatial Techniques in Practice |
| B24CV 363 | Sustainable Design Concept for Building Services | B24CV 364 | Fire Safety in Buildings |

| **Ability Enhancement Course / Skill Enhancement Course (AEC/SEC) – III** | | | |
|---|---|---|---|
| B24CV381 | Microsoft Excel for Data Analytics | B24CV382 | Smart Urban Infrastructure |
| B24CV383 | Problem Solving with Python | B24CV384 | Personality Development for Civil Engineers |

| **Non Credit Mandatory Courses (NCMC)** | | | |
|---|---|---|---|
| B24NCK391 | National Service Scheme (NSS) | B24NCK392 | National Cadet Corps (NCC) |
| B24NCK393 | Physical Education (PE) | B24NCK394 | Yoga |
| B24NCK395 | Music | | |

All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE), National Cadet Corps (NCC), Music and Yoga (YOG) with the concerned coordinator of the course during the first week of III/IV/V/VI semesters. Colleges are required to submit the Continuous Internal Evaluation (CIE) marks for the activities completed by students under selected course each semester. The students should be allowed to engage in different activities/courses each semester. For example, a student who participates in sports in the 3rd semester could choose to undertake NSS in the next semester and Yoga in another semester. This approach aligns with the student-centric focus of the National Education Policy (NEP) 2022 and helps distribute the workload related Physical Education/NSS/Yoga/NCC/Music of more evenly across different departments. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. **These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.**

**HoD** **Dean-Academics** **Principal**

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# Rajarajeswari College of Engineering

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## Department of Civil Engineering

Scheme of Teaching and Examinations : 2024

**(Effective from the Academic Year 2025-26)**

## Semester: IV

| S.No | Course Category and Course Code | | Course Title | TD / PSB | Teaching Hours / Week & Credits | | | | | Examination | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture | Tutorial | Practical | SDA | Credits | CIE Marks | SEE Duration Hrs | SEE Marks | Total Marks |
| | | | | | L | T | P | S | | | | | |
| 1. | PCC | B24CV401 | Environmental Engineering | CV | 3 | 0 | 0 | 0 | 3 | 50 | 3 | 50 | 100 |
| 2. | PCC | B24CV402 | Analysis of Structures | CV | 3 | 0 | 0 | 0 | 3 | 50 | 3 | 50 | 100 |
| 3. | IPCC | B24CV403 | Fluid Mechanics and Hydraulic Machines | CV | 3 | 0 | 2 | 0 | 4 | 50 | 3 | 50 | 100 |
| 4. | IPCC | B24CV404 | Highway Engineering | CV | 3 | 0 | 2 | 0 | 4 | 50 | 3 | 50 | 100 |
| 5. | PCCL | B24CV405L | Environmental Engineering Lab | CV | 0 | 0 | 2 | 0 | 1 | 50 | 3 | 50 | 100 |
| 6. | ESC | B24 CV46X | ESC/ETC/PLC - IV | CV | 3 | 0 | 0 | 0 | 3 | 50 | 3 | 50 | 100 |
| 7. | UHV | B24UHK407 | Universal Human values | Any Dept. | 1 | 0 | 0 | 0 | 1 | 50 | 1 | 50 | 100 |
| 8. | AEC/SEC | B24 CV 48X | Ability Enhancement Course / Skill Enhancement Course – III (Theory/Lab) | CVE | 1<br>0 | 0<br>0 | 0<br>2 | 0 | 1 | 50 | 1<br>3 | 50 | 100 |
| 9. | NCMC | B24NCK49X | National Service Scheme / National Cadet Corps / Physical Education / Yoga / Music | HSMC | 1 | 0 | 0 | | PP | 50 | | - | 50 |
| | | | | | | | | TOTAL | 20 | 450 | | 400 | 1000 |

BSC: Basic Science Course, HSMC: Humanity, Social sciences including Management courses, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, NCMC: Non-Credit Mandatory Course, AEC: Ability Enhancement Course, SEC: Skill Enhancement Course, ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course L: Lecture, T: Tutorial, P: Practical S:SDA- Skill Development Activity, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation, PP/NP: Pass/Not Pass, YY: Programme Code (EC, CS, IS etc), X: 1/2/3/4**,** K: Indicates Common Course to all the streams of Engineering

| **Engineering Science Course /Emerging Technology Course / Programming language Course (ESC/ETC/PLC) - IV** | | | |
|---|---|---|---|
| B24 CV 461 | Alternative Building Materials | B24CV462 | Rural, Urban Planning and Architecture |
| B24 CV 463 | Watershed Management | B24CV464 | Finance for Professionals |

| **Ability Enhancement Course / Skill Enhancement Course (AEC/SEC) – IV** | | | |
|---|---|---|---|
| B24CV481 | Building Services | B24 CV482 | Building Information Modeling in Civil Engineering – Basics |
| B24CV483 | Electronic Waste Management - Issues and Challenges | B24CV484 | GIS with QGIS |

| **Non Credit Mandatory Courses (NCMC)** | | | |
|---|---|---|---|
| B24NCK491 | National Service Scheme (NSS) | B24NCK492 | National Cadet Corps (NCC) |
| B24NCK493 | Physical Education (PE) | B24NCK494 | Yoga |
| B24NCK495 | Music | | |

All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE), National Cadet Corps (NCC), Music and Yoga (YOG) with the concerned coordinator of the course during the first week of III/IV/V/VI semesters. Colleges are required to submit the Continuous Internal Evaluation (CIE) marks for the activities completed by students under selected course each semester. The students should be allowed to engage in different activities/courses each semester. For example, a student who participates in sports in the 3rd semester could choose to undertake NSS in the next semester and Yoga in another semester. This approach aligns with the student-centric focus of the National Education Policy (NEP) 2022 and helps distribute the workload related Physical Education/NSS/Yoga/NCC/Music of more evenly across different departments. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities.

**These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.**

**HOD** **Dean-Academics** **Principal**

# III - Semester Syllabus

| SEMESTER-III | | | | | |
|---|---|---|---|---|---|
| **MATHEMATICS-III**<br>**Category: BSC**<br>**(COMMON TO R&A, CV)** | | | | | |
| Course Code | : | B24MZ301 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | Explain the basic concepts of probability, random variables, probability distribution |
| 2. | Calculate and interpret correlation coefficients to determine the strength and direction of linear relationships between variables. |
| 3. | To develop mathematical model to integrate some non integrable functions using special theorems. |
| 4. | To perform complex variables and to apply in signal transformation. |
| 5. | Ability to formulate a variational problem for a given geometric setting. |

| **Module-1: Probability distribution** | **No. of Hours** |
|---|---|
| Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples. Exponential distribution. | 9 |
| **Module-2: Curve fitting & Statistical Methods** | **No. of Hours** |
| **Curve Fitting:** Curve fitting by the method of least squares-fitting the curves of the form: $y = ax + b, y = ax^2 + bx + c$ and $y = ax^b$.<br>**Statistical methods:** Introduction to Moments, Skewness, Kurtosis and problems. Karl Pearson's coefficient of correlation and lines of regression. | 9 |
| **Module-3: Complex Variable -I** | **No. of Hours** |
| Review of a function of a complex variable, limits, continuity, and differentiability. Analytic function and connected theorem and properties, Cauchy-Riemann equations in Cartesian and polar forms.<br>**Transformations:** Conformal transformations, discussion of transformations: $w = z^2$, $w = e^z$ and bilinear transformations-problems.<br>**Application:** Analyzing alternating current (AC) circuits, signal processing. | 9 |
| **Module-4: Complex Variable -II** | **No. of Hours** |
| Complex line integral ,properties of Complex line integral, Cauchy's theorem ,consequences of cauchy's theorem, cauchy's integral formula, generalized cauchy's integral formula, Laurent's theorem-Laurent's series , singularity and Residue, formulae for the residue at the pole, Cauchy's Residue theorem (without proof) and problems.<br>**Application:** Calculating electric and magnetic fields, Fluid Dynamics. | 9 |
| **Module-5: Calculus of Variations:** | **No. of Hours** |
| Introduction to variation of functional, external of functional, Euler equation– special cases, problems. Geodesics, Hanging cable and Brachistochrone problems. Exploring geodesics graphically using MATLAB. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Explain the basic concepts of probability, random variables, probability distribution |
| CO2 | Make use of correlation and regression analysis to fit a suitable mathematical model for the statistical data. |
| CO3 | Illustrate the fundamental concepts of multivariate statistics, complex analysis, partial differential equations and variational problems. |
| CO4 | Understand the concept of complex variables and their applications in signal transformation. |
| CO5 | Demonstrate the ideas of complex differentiation and integration for solving related problems through theoretical approach. |

| **Text Books** | |
|---|---|
| 1. | B.S.Grewal:"Higher Engineering Mathematics", Khanna publishers,44$^{th}$Edition, 2018 |

| | |
|---|---|
| 2. | E.Kreyszig:"Advanced Engineering Mathematics",John Wiley & Sons,8th Edition, (Reprint),2016 |
| **Reference Text Books** | |
| 1. | H. K. Dass, "Advanced Engineering Mathematics" S. Chand publication. 4. C. Ray Wylie, Louis C. Barrett : "Advanced Engineering Mathematics", 6thEdition, 2. McGraw |
| 2. | C. Ray Wylie, Louis C. Barrett : "Advanced Engineering Mathematics", 6th edition, 2. McGraw |
| 3. | B.V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 208. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. https://nptel.ac.in/courses/12286025 |
| 2. VTUEDUSATPROGRAMME –20 |
| 3. http://www.class-central.com/subject/math(MOOCs) |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

## CONTINUOUS INTERNAL EVALUATION (CIE)

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

## SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO8 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | - | - | - | - | 1 | - | 2 |
| CO2 | 3 | 3 | 3 | 2 | - | - | - | - | 1 | - | 2 |
| CO3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 2 |
| CO4 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 2 |
| CO5 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **STRENGTH OF MATERIALS**<br>**Category:PCC** | | | | | |
| Course Code | : | B24CV302 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To understand the basic concepts of the stresses and strains for different materials and strength of structural elements. |
| 2. | To know the development of internal forces and resistance mechanism for one dimensional and two dimensional structural elements. |
| 3. | To analyze and understand different internal forces and stresses induced due to representative loads on structural elements. |
| 4. | To analyze and understand principal stresses due to the combination of two dimensional stresses on an element and failure mechanisms in materials. |
| 5. | To evaluate the behavior of torsional members, columns and struts. |

| **Module– 1: Simple Stresses and Strains** | **No. of Hours** |
|---|---|
| Simple Stresses and Strain: Introduction, Definition and concept and of stress and strain. Hooke's law, Stress-Strain diagrams for ferrous and non-ferrous materials, factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Elongation due to selfweight. Saint Venant's principle, Compound bars, Temperature stresses, Compound section subjected to temperature stresses, state of simple shear, Elastic constants and their relationship. | 9 |
| **Module– 2: Compound Stresses** | **No. of Hours** |
| Compound Stresses: Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses<br>Thin and Thick Cylinders: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lame's equation, radial and hoop stress distribution. | 9 |
| **Module– 3: Shear Force and Bending Moment** | **No. of Hours** |
| Shear Force and Bending Moment in Beams: Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations. | 9 |
| **Module– 4: Bending and Shear Stresses in Beams** | **No. of Hours** |
| Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections. Shear centre(only concept) Columns and Struts: Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns. | 9 |
| **Module– 5: Torsion in Circular Shaft** | **No. ofHours** |
| Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus Power transmitted by a shaft, combined bending and torsion. Theories of Failure: Introduction, maximum principal stress theory (Rankine's theory), Maximum shearing stress theory (Tresca's theory), Strain energy theory (Beltrami and Haigh), and maximum strain theory (St. Venant's theory). | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | To evaluate the strength of various structural elements internal forces such as compression, tension, shear, bending and torsion. |
| CO2 | To suggest suitable material from among the available in the field of construction and manufacturing. |
| CO3 | To evaluate the behavior and strength of structural elements under the action of compound stresses and thus understand failure concepts. |

| | |
|---|---|
| CO4 | To understand the basic concept of analysis and design of members subjected to torsion. |
| CO5 | To understand the basic concept of analysis and design of structural elements such as columns and struts. |

| **Text Books** | |
|---|---|
| 1. | Ferdinand P. Beer and E. Russel Johnston(jr), "Mechanics of Materials", Publisher, 6th Edition, 2013 |
| 2. | L.S.Srinath, Prakash Desai and Ananth, "Strength of materials", Ramu Publisher, 2nd Edition, 2009. |
| 3. | Basavarajaiah and Mahadevappa, "Strength of materials", CRC Press, 3rd Edition – 2018. |

| **Reference Text Books** | |
|---|---|
| 1. | Timoshenko and Young, "Elements of Strength of Materials", Affiliated East-West Press.. |
| 2. | James M. Gere, "Mechanics of Materials (FifthEdition)", Thomson Learning. |
| 3. | A S Arunkumar, Sreekeshava, B V Ravishankar, "Mechanics of Materials", IK Publishers. |
| 4. | I.B.Prasad, "Strength of Materials", Khanna Publisher. |
| 5. | P N Chandramouli, "Fundamentals of Strength of Materials", PHI Learning Pvt. Ltd. |
| 6. | Subramanian R, "Strength of Materials", Oxford University Press. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. Strength of Materials web course by IIT Roorkee https://nptel.ac.in/courses/112107146/ |
| 2. Strength of Materials video course by IIT Kharagpurhttps://nptel.ac.in/courses/105105108/ |
| 3. Strength of Materials video course by IIT Roorkeehttps://nptel.ac.in/courses/112107147/18 |
| 4. All contents organized http://www.nptelvideos.in/2012/11/strengthof-materials-prof.html |

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**CONTINUOUS INTERNAL EVALUATION (CIE)**

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
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3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | - | 1 | - | 1 | - | - | - | - | 2 |
| CO2 | 3 | 1 | 1 | 1 | - | 1 | - | - | - | - | 2 |
| CO3 | 3 | 1 | 1 | 1 | - | 1 | - | - | - | - | 2 |
| CO4 | 3 | 1 | - | 1 | - | 1 | - | - | - | - | 2 |
| CO5 | 3 | 1 | - | 1 | - | 1 | - | - | - | - | 2 |

Level 3- Highly, Level 2-Moderate, Level 1-Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **SURVEYING**<br>**Category: IPCC** | | | | | |
| Course Code | : | B24CV303 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:2 | SEE | : | 50 Marks |
| Total Hours | : | 45(T)+15(P) | Total | : | 100 Marks |
| Credits | : | 4 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | Ability to understand principles of both traditional and modern surveying applying knowledge of mathematics. |
| 2. | Ability to understand levelling |
| 3. | Ability to use Total station for data capture, data storage, data transfer |
| 4. | Ability to handle surveying equipment's and software tools to carry out field surveying, plot topographical Drawings and construction drawing |
| 5. | Ability to prepare construction drawing and setting out. |

| **Module – 1: Introduction to Surveying**: | **No. of Hours** |
|---|---|
| Definition of Surveying, Uses of Surveying, Basic principles of surveying, Classification of Surveys. Introduction to Chain surveying, Compass surveying, Plane table surveying and Theodolite surveying. Booking of chain survey work. Measurement of Distance- Various types of tapes, Laser distance meter | 9 |
| **Module – 2: Leveling** | **No. of Hours** |
| **Leveling:** Principles and basic definitions, Fundamental axes and parts of a dumpy level, types of adjustments and objectives, temporary adjustments of a dumpy level, Types of leveling – Simple leveling, Profile leveling, fly leveling and cross sectioning. Booking of levels 1. Rise and fall method 2. Height of instrument method – comparison, Arithmetic checks. Numerical problems. | 9 |
| **Module – 3: Contour Survey and Total Station survey** | **No. of Hours** |
| **Contour Survey:** Contours and their characteristics, Methods of contouring – direct and indirect methods (Grid and Cross section method), Uses of contours.<br>**Total Station:** Introduction - Parts of a Total Station – Accessories – Advantages - Limitations and Applications, Complete procedure for total station survey, data transfer, preparation of maps. | 9 |
| **Module – 4: Curves and measurement of Areas & Volumes** | **No. of Hours** |
| **Curves** –Types of Curves- Application of curves in civil engineering. Setting out of Horizontal curve by Theodolite (Rankine's method) and using Total Station. Components of Compound, Reverse curve. Transition Curve and Combined curve. Various types of vertical curves and its applications.<br>**Areas and Volumes**- Methods of determining areas by trapezoidal and Simpsons' rule.Measurement of volume by prismoidal and trapezoidal formula. Earthwork volume calculations from spot levels and from contour maps; Earthwork calculation in Embankments. | 9 |
| **Module – 5: Modern surveying** | **No. of Hours** |
| **Photogrammetry:** Principles of Photogrammetry, Types – Terrestrial and Aerial Photogrammetry, Advantages over ground survey methods - geometry of vertical photographs, scales of vertical photographs. Flight planning.<br>**Remote Sensing and GIS:** Introduction, Principles, Types and Applications of Remote Sensing. Introduction to GIS, functions and advantages, sources of data for GIS. Geographical Information System, Key Components of GIS, Functions of GIS, Data Management and Transformation | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Summarize various types of surveying and carry out distance measurement using various equipment's |
| CO2 | Illustrate the use and applications of levelling |
| CO3 | Plot contours, longitudinal and cross sections for construction projects. |
| CO4 | Set curves for construction works and carry out estimation of areas and volumes. |
| CO5 | Demonstrate the necessary skills to carry out modern Surveying |

| **Text Books** | |
|---|---|
| 1. | Punmia B.C, "Surveying" Vol.I and Vol.II, Laxmi Publications, (P) Ltd, New Delhi 2010. ISBN 81-7008-853-4 |
| 2. | Duggal S.K, "Surveying", Vol.I& II, Tata McGraw Hill Publishing Co., 2009, ISBN 978-0-07-015137-6: ISBN 0-07-015137-7. |

| **Reference Text Books** | |
|---|---|
| 1. | Chandra A.M, "Plane surveying", Newage International (P) Ltd., 2009. ISBN 81-224-1902-X |
| 2. | Remote Sensing and GIS by B Bhatia, Oxford University Press, New Delhi |
| 3. | Arora K.R, "Surveying", Vol.I& II, Standard Book House, 2009. ISBN 81-89401-23-8 |
| 4. | Lillesand and Kiefer, "Principles of Remote sensing and Image Interpretation", (5th Edition) John Wiley Publishers, New Delhi, 2007 |

| **Web links and Video lectures (e-Resources)** |
|---|
| **1. https://enterprise.dji.com/surveying/land-surveying**<br>**2. https://www.gps.gov/applications/survey/**<br>**3. https://www.constructionplacements.com/total-station-in-surveying-types-uses-andapplications/**<br>**4. https://www.youtube.com/watch?v=bbs5AEPstl4**<br>**5.https://www.youtube.com/watch?v=KHI4TEeexuM&list=PLLy_2iUCG87DwNVc3Mz1yYlRA42jSQ1tB&index=28**<br>**6. https://www.youtube.com/watch?v=Iu9vrE48_I4&list=PLLy_2iUCG87DwNVc3Mz1yYlRA42jSQ1tB&index=30**<br>**7. https://www.youtube.com/watch?v=RXUi2cX4CkU**<br>**8. https://www.youtube.com/watch?v=SVa66vO08So** |

## LABORATORY

***Practical Component of IPCC (10 Experiments)***

| Sl. No | Name of the experiment |
|---|---|
| 1. | To conduct a chain survey of flat area with details including field book entry, perpendicular and offsets. |
| 2. | Distance measurement by Use of Various types of tapes, Laser distance meter |
| 3. | Differential levelling by Dumpy level by plane of collimation method |
| 4. | Measurement of horizontal and vertical angles by Theodolite. Method of repetition |
| 5. | Setting out simple curve using Rankine's method using Theodolite |
| 6. | Setting out central line of a small residential building |
| 7. | Measurement of Distance, slope and vertical distance using Total station |
| 8. | Measurement horizontal and vertical angles using Total station |
| 9. | Coordinate measurement with Total station |
| 10. | Demonstration of Equipment's used for chain, compass and plane table surveying |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

The CIE marks for the theory component of the Integrated Course (IC) shall be 30 marks and for the laboratory component 20 marks.

## CONTINUOUS INTERNAL EVALUATION (CIE)

**CIE FOR THE THEORY COMPONENT OF IC:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes / Weekly test / project work for (20+20) marks, scaled down to **20 marks.**
4. Total marks scored **(30+20 = 50 marks)** scaled down to **25.**

**CIE FOR THE PRACTICAL COMPONENT OF IC:**

1. On completion of every experiment / program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
2. Each experiment is evaluated for 10 marks and scaled down to **5 marks.**
3. Laboratory test at the end of the 15$^{th}$ week of the semester / after completion of all the experiments shall be conducted for **50 marks** and scaled down to **20 marks.**
4. Total marks scored for lab component: **05+20=25 marks**.
5. The minimum marks to be secured in CIE to appear for SEE shall be 10(40% of maximum marks 25) in the theory and 10(40% of Maximum marks 25) in the practical.
6. The laboratory component of the **integrated course** shall be CIE only. However, in SEE, the questions from the practical component shall be included.

| Theory | | | | |
|---|---|---|---|---|
| **IA Test** | **Exam conducted for** | **Scaled down to** | **Average of best two tests** | **Total** |
| **IA-1** | **50** | **30** | **30** | **50/2=25** |
| **IA-2** | **50** | **30** | | |
| **IA-3** | **50** | **30** | | |
| **Two Assignments** | **2×10=20** | **10** | **10** | |
| **Two Quizzes** | **2×10=20** | **10** | **10** | |

| LAB | | | |
|---|---|---|---|
| **Continuous performance and record writing** | **Each experiments evaluated for 10 marks** | **Scaled down to 05 marks** | **5+20=25** |
| **Internal Test + Viva voce** | **Exam conducted for 50 marks** | **Scaled down to 20 marks** | |

## SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. The maximum marks from the practical component to be included in the SEE question paper is **16 marks.**
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | - | 1 | - | 1 | 1 | - | - | 1 | 2 |
| CO2 | 2 | - | - | 1 | - | 1 | 1 | - | - | - | - |
| CO3 | - | 1 | - | 1 | - | 1 | 1 | - | - | - | - |
| CO4 | 1 | - | - | 1 | - | 1 | 1 | - | - | 1 | - |
| CO5 | - | 1 | - | 1 | - | 1 | 1 | - | - | 1 | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **EARTH SCIENCE FOR ENGINEERS**<br>**Category: IPCC** | | | | | |
| Course Code | : | B24CV304 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:2 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) + 15(P) | Total | : | 100 Marks |
| Credits | : | 4 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To inculcate the importance of earth's interior and application of Geology in civil engineering in GeoHazard mitigation and management |
| 2. | To provide knowledge on dynamic Geology and its importance in modifying the physical character of Rocks which cause rocks suitable or unsuitable in different civil engineering projects such as Dams, bridges, tunnels and highways |
| 3. | To educate the ground water management regarding diversified geological formations. |
| 4. | To provide decision support on the nature of the basic raw materials used in construction. To provide decision support on Lithological characters and subsurface conditions |
| 5. | To understand the application of Remote Sensing and GIS, Natural disaster and management and Environmental awareness. To understand the subsurface using geospatial data |

| **Module – 1 Introduction, the scope of earth science in Engineering** | **No. of Hours** |
|---|---|
| Earth's internal structure and composition, internal dynamics and Plate tectonics, Earthquakes- types, causes, so-seismic lines, seismic zonation, seismic proof structures. Volcanic eruption -types, causes. Landslides-causes types, preventive measures; Tsunami – causes, consequences, mitigation. Cyclones - causes and management. | 9 |
| **Module – 2: Earth Materials in Construction** | **No. of Hours** |
| Minerals -Industrial, rock-forming and ore minerals. Physical properties, composition. Rocks Types, structure/Texture, mineral composition occurrence, properties. Decorative (facing/polishing), railway ballast, rocks for masonry work, monumental/architecture, Dressing of stones, Requirement of good building stones. | 9 |
| **Module – 3: Earth Surface process and Resources** | **No. of Hours** |
| Weathering, type, causes, soil insitu, drifted soil, soil profile, soil mineralogy, structure, types of soil, Black cotton soil v/s Lateritic soil; effects of weathering on monumental rocks. Soil Horizon, Soil Classification by Grain Size. | 9 |
| **Module – 4: Surface and sub investigation for deep foundation** | **No. of Hours** |
| Dip and strike, and outcrop problems(numerical problem geometrical/ simple trigonometry based), Borehole data(and problems), Faults, folds, unconformity, joints, types, recognition and their significance in Civil engineering projects like tunnel project, dam project, Reservoir site,. | 9 |
| **Module – 5: Modern Tools and geophysical methods** | **No. of Hours** |
| Rocks as aquifers, water-bearing properties igneous, sedimentary and metamorphic rocks ,Coefficient of permeability, factors affecting permeability, Electrical Resistivity meter, depth of water table, (numerical problems), seismic studies. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Apply geological knowledge in different civil engineering practice |
| CO2 | Acquire knowledge on durability and competence of foundation rocks, and will be able to use the best building materials. |
| CO3 | Students will become competent enough for the safety, stability, economy and life of the structures that they construct |
| CO4 | Able to solve various issues related to ground water exploration, build up dams, bridges, tunnels which are often confronted with ground water problems |
| CO5 | Students will become Intelligent enough to apply GIS, GPS and remote sensing as a latest tool in different civil engineering for safe and solid construction. |

| **Text Books** | |
|---|---|
| 1. | Physical and Engineering Geology, by S.K. Garg, Khanna publishers |
| 2. | Principles of Engineering Geology, by KVGK Gokhale, BS Publications |

| **Reference Text Books** | |
|---|---|
| 1. | Introduction to Environmental Geology by Edward A Keller, Pearson publications. |
| 2. | Engineering Geology and Rock Mechanics B. P. Verma, Khanna publishers |
| 3. | Principles of Engineering Geology and Geotechnics, Krynine and Judd, CBS Publications |
| 4. | Engineering Geology, by Parthasarathy et al, Wiley publications |

**Web links and Video lectures (e-Resources)**

1. https://www.youtube.com/watch?v=aTVDiRtRook&list=PLDF5162B475DD915F
2. https://www.youtube.com/watch?v=EBiLLJAxBuU&index=2&list=PLDF5162B475DD915F
3. https://www.youtube.com/watch?v=sTY-ao4RZck&list=PLDF5162B475DD915F&index=3
4. https://nptel.ac.in/courses
5. https://youtu.be/fvoYHzAhvVM
6. https://youtu.be/aTVDiRtRook
7. https://serc.carleton.edu/NAGTWorkshops/hazards/events/12262004.html?serc_source=
8. recommendation
9. https://serc.carleton.edu/NAGTWorkshops/visualization/examples/CBezanson.html?sercsource=recom
10. mendation
11. https://serc.carleton.edu/NAGTWorkshops/coursedesign/goalsdb/14712.html
12. https://www.earthsciweek.org/classroom-activities

## LABORATORY

***Practical Component of IPCC (10 Experiments)***

| Sl. No | List of Experiments |
|---|---|
| 1. | Identification of common minerals based on Physical Properties |
| 2. | Identification of rocks used in building construction based on Physical properties |
| 3. | Solving Geological maps for suitability for aqua duct |
| 4. | Geological maps with inclined beds, suitability for tunnels/ Dams |
| 5. | Geological maps with folds, in tunnels/ Dams |
| 6. | Geological maps with unconformity , in tunnel/dam project |
| 7. | Geological maps with faults in Dams/tunnels project |
| 8. | Geospatial data analysis -Interpretation of toposheets |
| 9. | Geospatial data analysis - Visual interpretation of FCCs (Geomorphology and Landuse/landcover mapping) |
| 10. | Electrical resistivity methods for subsurface investigation – and its Interpretation, lateral and vertical sounding |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

The CIE marks for the theory component of the Integrated Course (IC) shall be 30 marks and for the laboratory component 20 marks.

## CONTINUOUS INTERNAL EVALUATION (CIE)

**CIE FOR THE THEORY COMPONENT OF IC:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes / Weekly test / project work for (20+20) marks, scaled down to **20 marks.**
4. Total marks scored **(30+20 = 50 marks)** scaled down to **25.**

**CIE FOR THE PRACTICAL COMPONENT OF IC:**

1. On completion of every experiment / program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
2. Each experiment is evaluated for 10 marks and scaled down to **5 marks.**
3. Laboratory test at the end of the 15$^{th}$ week of the semester / after completion of all the experiments shall be conducted for **50 marks** and scaled down to **20 marks.**
4. Total marks scored for lab component: **05+20=25 marks**.
5. The minimum marks to be secured in CIE to appear for SEE shall be 10(40% of maximum marks 25) in the theory and 10(40% of Maximum marks 25) in the practical.
6. The laboratory component of the **integrated course** shall be CIE only. However, in SEE, the questions from the practical component shall be included.

| Theory | | | | |
|---|---|---|---|---|
| **IA Test** | **Exam conducted for** | **Scaled down to** | **Average of best two tests** | **Total** |
| **IA-1** | **50** | **30** | **30** | **50/2=25** |
| **IA-2** | **50** | **30** | | |
| **IA-3** | **50** | **30** | | |
| **Two Assignments** | **2×10=20** | **10** | **10** | |
| **Two Quizzes** | **2×10=20** | **10** | **10** | |

| LAB | | | |
|---|---|---|---|
| **Continuous performance and record writing** | **Each experiments evaluated for 10 marks** | **Scaled down to 05 marks** | **5+20=25** |
| **Internal Test + Viva voce** | **Exam conducted for 50 marks** | **Scaled down to 20 marks** | |

## SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. The maximum marks from the practical component to be included in the SEE question paper is **16 marks.**
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | 1 | - | 1 | - | - | - | - | - |
| CO2 | 2 | - | - | 1 | - | - | - | - | - | - | 1 |
| CO3 | 2 | 1 | - | 1 | - | - | - | - | - | - | - |
| CO4 | 2 | 1 | - | 1 | - | 2 | - | - | - | - | - |
| CO5 | 1 | - | - | 1 | - | - | - | - | - | - | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **BUILDING MATERIALS TESTING LAB**<br>**Category: PCCL** | | | | | |
| Course Code | : | B24CV305L | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 0 : 0 : 2 | SEE | : | 50 Marks |
| Total Hours | : | 15(P) | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials. |
| 2. | Ability to function on multi-disciplinary teams in the area of materials testing. |
| 3. | Ability to use the techniques, skills and modern engineering tools necessary for engineering. |

| **Sl. No** | **List of Experiments** |
|---|---|
| 1. | Tension test on mild steel and HYSD bars. |
| 2. | Compression test on mild steel, cast iron and wood. |
| 3. | Torsion test on mild steel circular sections. |
| 4. | Bending Test on Wood Under two point loading. |
| 5. | Shear Test on Mild steel- single and double shear. |
| 6. | Impact test on Mild Steel by Charpy. |
| 7. | Impact test on Mild Steel by Izod. |
| 8. | Hardness tests on ferrous and non-ferrous metals – Brinell's, Rockwell and Vicker's. |
| 9. | Test on Bricks and Tiles. |
| 10. | Tests on Fine aggregates – Moisture content, Specific Gravity, Bulk density, Sieve analysis and Bulking. |
| 11. | Tests on Coarse aggregates – Absorption, Moisture content, Specific Gravity, Bulk density and Sieve analysis. |
| 12. | Demonstration of Strain gauges and Strain Indicators. |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion. |
| CO2 | Identify, formulate and solve engineering problems of structural elements subjected to flexure. |
| CO3 | Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to undesirable materials. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. 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 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)

| Component | Scale down to | Total Marks |
|---|---|---|
| Conduction of experiments and Record Writing (Each Experiment evaluated for 10 marks) | 20 | 20 |
| Internal Lab Test 1(After 6 experiments)<br>Exam conduction for 50 marks | 15 | 15 |
| Internal Lab Test 2 (After 6 experiments)<br>Exam conduction for 50 marks | 15 | 15 |
| | **CIE** | **50** |

## SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Students can pick one question (experiment) from the questions lot prepared by the examiners.
4. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
5. Rubrics suggested for SEE, 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.
6. 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 03 hours.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | 1 | 1 | - | 1 | - | - | - | 2 | - |
| CO2 | 1 | 1 | 1 | 1 | - | 1 | - | - | - | 2 | - |
| CO3 | 1 | 1 | 1 | 1 | - | 1 | - | - | - | 2 | - |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **BUILDING MATERIALS AND CONSTRUCTION**<br>**Category: ESC/ETC/PLC-III** | | | | | |
| Course Code | : | B24CV361 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To recognize good construction materials based on properties. |
| 2. | To investigate soil properties and design suitable foundation. |
| 3. | To understand the types and properties of masonry materials and supervise masonry construction |
| 4. | To gain knowledge of structural components like lintels, arches, staircase and roofs flooring, plastering, painting. |

| **Module– 1: Building Materials** | **No. of Hours** |
|---|---|
| Stone as building material, Requirement of good building stones, Dressing of stones, Deterioration and Preservation of stone work.<br>**Fine aggregate:** Natural and manufactured: Sieve analysis, zoning, specify gravity, bulking, moisture content, deleterious materials.<br>**Coarse aggregate:** Natural and manufactured: Importance of size, shape and texture. Grading of aggregates, Sieve analysis, specific gravity<br>**Timber:** Varieties and uses – defects in timber and causes of decay, Test for good timber, seasoning, preservation & fire proofing, plywood & its uses. | 9 |
| **Module– 2: Foundation, Wall, Lintel & Arches** | **No. of Hours** |
| **Foundation**: Preliminaryinvestigationofsoil,safebearingcapacityofsoil,Functionandrequirements of good foundation, types of foundation, introduction to spread, combined , strap, mat and pile foundation<br>**Types of walls:** Load bearing, partition walls, and cavity walls.<br>**Lintels and Arches:** Definition, function and classification of lintels, Balconies, chejja and canopy. Arches; Elements and Stability of an Arch | 9 |
| **Module– 3: Floors, roof & Stairs** | **No. of Hours** |
| **Floors:** Requirement of good floor, Components of ground floor, Selection of flooring material Procedure for laying of Concrete (VDF), Mosaic, Kota, Slate, Marble, Granite, Tile flooring, Cladding of tiles.<br>**Roof:** Requirement of good roof, Types of roof, Elements of a pitched roof, Trussed roof, King post Truss, Queen Post Truss, Steel Truss, Different roofing materials, R. C. C. Roof.<br>**Stairs:** Definitions, technical terms and types of stairs: Wood, RCC, and Metal. Requirements of good stairs. | 9 |
| **Module– 4: Doors, Windows, Ventilators & Formwork:** | **No. of Hours** |
| **Doors and Windows:** Location of doors and windows, technical terms, Materials for doors and windows: PVC, CPVC and Aluminum. Types of Doors and Windows: Paneled, Flush, Collapsible, Rolling shutter, Paneled and glazed Window, Bay Window, French window. Steel windows, Ventilators. Sizes as per IS recommendations.<br>**Formwork:** Introduction to form work, scaf folding, shoring, under pinning | 9 |
| **Module– 5: Plastering, Pointing, Damp proofing and Paints** | **No. of Hours** |
| **Plastering and Pointing:** Mortar and its types. Purpose, materials and methods of plastering and pointing: Sand faced plastering, Stucco plastering, lathe plastering, and defects in plastering. Water proofing with various thicknesses.<br>**Damp proofing:** causes, effects and methods.<br>**Paints:** Purpose, types, technical terms, ingredients and defects, Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Select suitable materials for buildings and adopt suitable construction techniques. |
| CO2 | Decide suitable type of foundation based on soil parameters |
| CO3 | Supervise the construction of different building elements based on suitability |

| | |
|---|---|
| CO4 | Exhibit the knowledge of building finishes and form work requirements. |

| **Text Books** | |
|---|---|
| 1. | Sushil Kumar "Building Materials and construction", 20th edition,reprint2015,StandardPublishers |
| 2. | Dr. B. C. Punmia, Ashok kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications (P) ltd., New Delhi. |

| **Reference Text Books** | |
|---|---|
| 1. | Engineering materials by Rangawala |
| 2. | Engineering Materials by Sunil Kumar |
| 3. | Engineering Materials by Roy Choudhary. |
| 4. | A Text book of Engineering Materials, by G.J. Kulkarni |
| 5. | Advances in Building Materials and Construction by Mohan Rai and M.P. Jain Singh – publication by CBRI, Roorkee |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. https://youtu.be/EIDXE28_8eQ<br>2. https://youtu.be/R2dNp5tLni0<br>3. https://youtu.be/uPAE2ZcFdo4 |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | - | - | - | 2 |
| CO2 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | - | - | - | 2 |
| CO3 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | - | - | - | 2 |
| CO4 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | - | - | - | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **GEOSPATIAL TECHNIQUES IN PRACTICE**<br>**Category: ESC/ETC/PLC-III** | | | | | |
| Course Code | : | B24CV362 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To introduce the concept of various geospatial technologies used in the industry |
| 2. | To help to acquire basic idea about the processing and mapping with modern surveying equipment. |
| 3. | To elaborate proven concepts, business practices and applications of geospatial technology |
| 4. | To explain learners understand how geospatial concepts are leveraged in handling real world business challenges of engineering and construction industry. |
| 5. | To illustrate the various geospatial emerging trends of GIS in Industry. |

| **Module– 1: Need of Geospatial technology in Industry** | **No. of Hours** |
|---|---|
| Geospatial in Day to Day Life, Spatial thinking, Evolution of location technology and importance of geography and maps. Need for spatial information, Terminologies, logic, language and formats of spatial technology. Location perspective of construction industry, Overview of Geospatial technology in tenders, Design and execution and Construction lifecycle management. Fundamentals and components of Geospatial Engineering, Surveying and Conventional survey equipment Vs Modern surveying equipment Components. Digital Land Surveying Needs. | 9 |
| **Module– 2: Total Station and Global Navigation Satellite System (GNSS)** | **No. of Hours** |
| Basics of Surveying, Introduction to Survey and Mapping, Geospatial Surveying Equipment, Demo of Total Station Equipment, Setting out and mapping, Advanced geospatial solutions, GNSS Overview of components, working and signal structure of Global navigation System. | 9 |
| **Module– 3: Geospatial Engineering and technology** | **No. of Hours** |
| Remote Sensing Technologies, Types of remote sensing, Sensors and its types, Application of sensors & platforms, Image Acquisition, Applications of Remote Sensing. 3D scanning, Principles and the science behind photogrammetry, LIDAR, RADAR and SONAR. Introduction to Platforms and working. | 9 |
| **Module– 4: Geographical Information System** | **No. of Hours** |
| Basics of GIS, Vector & Raster data models, Types and components of a Map. Hardware for GIS, DEM and TIN Data products, Attribute Data Types. Basic GIS data conversions, conversions from non-spatial formats spatial formats. Demo of to Conversion of Excel to GIS, Demo of Conversion of CAD TO GIS, Demo of Downloading and Geo-referencing Topo sheets and Raster files. | 9 |
| **Module– 5: Applications and Future trends of Geospatial Technologies** | **No. of Hours** |
| Application of GIS – Spatial Analysis, Catchment Area delineation, Overlay Analysis, Cluster Analysis, Hotspot Analysis and View shed Analysis. Future Trends of Geospatial Technologies. Case Study 1 –Benefit Realization - Case Study 2 Advancements in Modern Survey & Mapping Technologies, Advancements in Spatial Analytics – Geo Intelligence, Future Trends, Geospatial Technology - Way Forward.. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Comprehend different geospatial techniques in the Construction Industry. |
| CO2 | Understand the application of geospatial equipment like Total Station, GNSS, LIDAR, UAV (Drones) |
| CO3 | Evaluate the various spatial analysis operations by using GIS Environment |
| CO4 | Create a map layout with all essential cartographic elements in GIS Environment |
| CO5 | Illustrate the various geospatial emerging trends of GIS in Industry. |

| **Text Books** | |
|---|---|
| 1. | T. P. Kanetkar and S. V. Kulkarni, Surveying and Levelling, Parts 1 & 2, Pune VidyarthiGrihaPrakashan, Pune, 2010, 24th edition.. |

| **Reference Text Books** | |
|---|---|
| 1. | James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, 7thEdition, McGraw Hill 2001 |

| | |
|---|---|
| 2. | M. Anij Reddy. Textbook of Remote Sensing and Geographical Information systems. BSPublications, 2012 |
| 3. | George Joseph and C. Jeganathan, Fundamentals of Remote Sensing, 3rdEditionUniversities Press (India) Private limited, Hyderabad, 2018 |
| 4. | SatheeshGopi, R. Sathikumar, N. Madhu, — Advanced Surveying, Total Station GPSand Remote Sensing — Pearson education, 2ndEdition,2017. |


| **Web links and Video lectures (e-Resources)** |
|---|
| E-learning content on L&T EduTech Platform. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 1 | 1 | - | - | - | - | - | - |
| CO2 | 3 | 3 | 1 | 1 | 1 | - | 1 | - | - | - | - |
| CO3 | - | 3 | 1 | 1 | - | - | - | - | - | - | - |
| CO4 | 2 | - | 1 | 1 | 1 | - | 1 | - | - | - | - |
| CO5 | 1 | 1 | 1 | 1 | 2 | - | - | - | - | - | - |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **SUSTAINABLE DESIGN CONCEPT FOR BUILDING SERVICES**<br>**Category: ESC /ETC/PLC-III** | | | | | |
| Course Code | : | B24CV363 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To facilitate learners to understand sustainable building designs and its parameters such as energy and water efficiency, Comfort in buildings, and waste management. |
| 2. | To expose the learners to shading systems, thermal and visual comfort. |
| 3. | To impart fundamental knowledge on Life cycle assessment and Green ratings and certifications. |
| 4. | To adopt green project management methodology and evaluate building life cycle assessment |
| 5. | To implement green practices during construction and operation phase of the buildings for achieving green rating. |

| **Module– 1:Introduction to Sustainability and Climatology** | **No. of Hours** |
|---|---|
| Overview of Sustainability – Global energy scenario, carbon footprint and climate action, Net zero in carbon offsetting, Water neutral, Sustainable construction and resource management. Green buildings - Selection of site – preservation and planning Influence of climate on buildings, Basics of climatology, Earth – Sun relationship, Solar angles and sun path diagram, Design of shading systems. | 9 |
| **Module– 2: Comfort in Buildings** | **No. of Hours** |
| Thermal comfort – Basics of Thermodynamics, Convection/radiation heat transfer, Heat gain through various elements of a building, Thermal comfort models and case studies Acoustics – Building acoustics, measures, defects and prevention of sound transmission Indoor Air Quality – Effects, design consideration and integrated approach for IAQ management Visual comfort – Enhancement strategies for Daylighting and Artificial | 9 |
| **Module– 3: Energy, water efficiency and waste management in building** | **No. of Hours** |
| Energy efficiency – Energy efficiency in building envelope and energy efficient HVAC and Lighting as per Energy conservation building code (ECBC) 2017, Energy simulation, Energy management system – Renewable energy and Energy Audit. Water Efficiency – Planning and design of water management system, Rain water harvesting, Water efficient design and fixtures, Treatment and reuse and Water efficient landscape system. Waste management – Types of waste and its treatment methods, Construction and demolition waste management, Waste management in residential, commercial buildings, healthcare facilities. | 9 |
| **Module– 4: Life Cycle Assessment of Buildings and Green project management** | **No. of Hours** |
| Materials – Green product certifications, features of sustainable building materials and sustainable alternatives for structural, envelope and finishing materials. Low carbon cement, Zero emission bricks and lean construction practices. Life cycle assessment and its types – Modeling and Analysis, 22/07/2023 Annexure-II 2 Greenhouse gas emission. Different phases of Green building project management. | 9 |
| **Module– 5: Sustainable rating systems** | **No. ofHours** |
| Green building rating systems- LEED, BREEAM and others, Indian Green building rating systems – IGBC & GRIHA. IGBC criteria for certification -site selection credits, pre-design credits, detailed design credits, pre-construction credits, construction credits, post construction credits. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Comprehend sustainable design, climatology, shading system and analyze heat transfer mechanism in buildings. |
| CO2 | Assess the design considerations and parameters for thermal comfort, visual comfort, indoor air quality and acoustics. |
| CO3 | Develop solutions for energy efficiency, water efficiency and waste management in buildings. |
| CO4 | Adopt green project management methodology and evaluate building life cycle assessment |
| CO5 | Implement green practices during construction and operation phase of the buildings for achieving green rating. |

| **Text Books** | |
|---|---|
| 1. | Dr. Adv. HarshulSavla, Green Building: Principles & Practices |

| **Reference Text Books** | |
|---|---|
| 1. | HarharaIyer G, Green Building Fundamentals, Notion Press |
| 2. | IGBC Green new building rating system - version 3.0 - Abridged reference guide |
| 3. | The Sustainable Habitat Handbook (6 Volume Set), GRIHA Version 2019 |
| 4. | National Building Code – 2016, Volume 1&2, Bureau of Indian Standards |
| 5. | Energy Conservation Building Code – 2017 (with amendments up to 2020), Bureau of Energy Efficiency |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. E-learning content on L&T EduTech Platform. |
| 2. http://kcl.digimat.in/nptel/courses/video/124107011/L33.html |
| 3. http://acl.digimat.in/nptel/courses/video/105102195/L42.html |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

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**CONTINUOUS INTERNAL EVALUATION (CIE)**

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | 1 | - | 2 | 1 | - | - | - | 1 |
| CO2 | 2 | 2 | 2 | 1 | - | 2 | 1 | - | - | - | 2 |
| CO3 | 2 | 2 | 2 | 1 | - | 1 | 1 | - | - | - | 1 |
| CO4 | 2 | 2 | 1 | 1 | - | 2 | 1 | - | - | - | 1 |
| CO5 | 2 | 2 | 1 | 1 | - | 2 | 1 | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **FIRE SAFETY IN BUILDINGS**<br>**Category: ESC/ETC/PLC-III** | | | | | |
| Course Code | : | B24CV364 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To understand the importance fire safety |
| 2. | To learn various techniques involved in fire safety |
| 3. | To design fire resistant buildings using proper materials and methods |
| 4. | To design flow network in buildings & electrical systems and maintenance |
| 5. | To perform health evaluation of buildings and suggest remedies |

| **Module – 1: Fire** | **No. of Hours** |
|---|---|
| Introduction, Basic concepts of fire protection, Fire as a process of combustion, planning for fire protection, fire resistance Ventilation and fuel controlled fire, process of combustion: flash over condition, effect of fire on construction material, design of fire resistance steel structure, concrete structure | 9 |
| **Module – 2:Fire safety** | **No. of Hours** |
| Urban planning, escape and refuge, internal planning, detection and suppression Introduction to lift design, design of lift system, expected stop and floor of reversal, different cases, simulation, arrangements and escalators | 9 |
| **Module – 3:Introduction to flow system** | **No. of Hours** |
| Water supply, constant demand, variable demand and diversity factor, control systems Flow in pipe networks and fixture units, design of water supply distribution system, flow in waste water pipes | 9 |
| **Module – 4:Introduction to HVAC** | **No. of Hours** |
| Governing equations to HVAC process, numerical problem on HVAC system, psychometric chart, equation based approach<br>**Electrical systems:** design of electrical systems, intelligent building, life cycle cost and basics of building maintenance, stages of maintenance management, planning for building maintenance, periodicity of maintenance management, estimation of repair cycle, cost profile of maintenance, lamp replacement, building inspection, planned and Ad-hoc maintenance. | 9 |
| **Module – 5:Condition survey and health evaluation of buildings** | **No. of Hours** |
| Condition survey and health evaluation of buildings, diagnosis of building by visual survey, case studies of visual survey, effect of corrosion and alkali aggregate reaction, sampling and choice of test location Non-destructive testing, core strength test, carbonation and chloride measurement, electrical method of progress measurement Repair, rehabilitation, retrofit, periodicity and economics of condition survey, interpretation of test results | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understand types of fire, combustion process and fire resistance |
| CO2 | Plan for fire safety and design of lifts |
| CO3 | Design flow network in buildings |
| CO4 | Design of electrical systems and maintenance |
| CO5 | Perform health evaluation of buildings and suggest remedies |

| **Text Books** | |
|---|---|
| 1. | VK Jain, Fire SafetyinBuildings,ISBN-13978-938980219,NewAge International Private Limited;3rd edition, 2020 |
| 2. | Fire protection, services and maintenance management of building, NPTEL video lecture, IIT, Delhi |
| 3. | Bureau of Indian Standards, "HANDBOOK OF FUNCTIONAL REQUIREMENTS OF BUILDINGS, (SP-41& SP- 32)", BIS 1987and 1989. |
| 4. | Markus, T. A. & Morris, E. N. ,"BUILDING CLIMATE ANDENERGY" Pitman publishing limited. 1980. |
| 5. | Croome,J.D.&Roberts,B.M.," AIR CONDITIONING AND VENTILATION OF BUILDINGS VOL-1".Pergamon press. |
| 6. | Building Services Design- T.W.MEVER |

| | |
|---|---|
| 7. | Building Engineering & System Design -F.S.MERRIT&J.AMBROSE |
| 8. | SP-35(1987): Hand book of Water supply & drainage-BIS |
| 9. | Concept of building firesafety-D.EGAN |
| 10. | Design of fire resisting structures - H.L.MALHOTRA. |

| **Reference Text Books** | |
|---|---|
| 1. | An introduction to fire dynamics-D.DRYSDALE |
| 2. | Structural fire protection Edit by T.T.LIE |
| 3. | Elevator technology-G.C.BARNEY |
| 4. | HEATINGVENTILATINGAND AIRCONDITIONING Analysis and Design-Faye C. Mc Quiston and Jerald D. Parker. |
| 5. | Building Maintenance Management-R.LEE |
| 6. | Developments In Building Maintenance-I.EJ.GIBSON |
| 7. | Concrete Structures: materials, Maintenance and Repair D.CAMPBELL,ALLEN&H.ROPER |

| **Web links and Video lectures (e-Resources)** |
|---|
| **1. https://archive.nptel.ac.in/courses/105/102/105102176/** |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

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## CONTINUOUS INTERNAL EVALUATION (CIE)

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

## SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | - | - | 2 | 1 | 2 | - | - | - | - | 1 |
| CO2 | 2 | 1 | - | - | 2 | 1 | 2 | - | - | - | - | 1 |
| CO3 | 2 | 1 | - | - | 2 | 1 | 2 | - | - | - | - | 1 |
| CO4 | 2 | 1 | - | - | 2 | 1 | 2 | - | - | - | - | 1 |
| CO5 | 2 | 1 | - | - | 2 | 1 | 2 | - | - | - | - | 1 |

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

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **MICROSOFT EXCEL FOR DATA ANALYTICS**<br>**Category: AEC/SEC-III** | | | | | |
| Course Code | : | B24CV381 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 0 : 0 : 2 | SEE | : | 50 Marks |
| Total Hours | : | 15(P) | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To Apply analysis techniques to datasets in Excel |
| 2. | Learn how to use Pivot Tables and Pivot Charts to streamline your workflow in Excel |
| 3. | Understand and Identify the principles of data analysis |
| 4. | Become adept at using Excel functions and techniques for analysis |

| **Sl. No** | **List of Experiments** |
|---|---|
| 1. | Introduction to Data Analysis Using Spreadsheets: Fundamentals of spreadsheet applications, Excel interface, and learn how to navigate around a worksheet and workbook. |
| 2. | Using Excel Spreadsheets: Perform basic spreadsheet tasks, such as viewing, entering and editing data, and moving, copying and filling data. |
| 3. | Learn about the fundamentals of formulas, and learn about the most common functions used by a data analyst. Finally, you will learn how to reference data in formulas. |
| 4. | Cleaning & Wrangling Data Using Spreadsheets: Importance of data quality, how to import file data in to Excel, fundamentals of data privacy, remove duplicate and inaccurate data, and how to remove empty rows in your data.. |
| 5. | How to deal with inconsistencies in your data and how to use the Flash Fill and Text to Columns features to help you manipulate and standardize your data |
| 6. | Analyzing Data Using Spreadsheets: Fundamentals of analyzing data using a spreadsheet, and learn how to filter and sort data. |
| 7. | Learn how to use some of the most useful functions for a data analyst |
| 8. | How to use the VLOOKUP and HLOOKUP reference functions. In addition, learn how to create pivot tables in Excel, and use several pivot table features |
| 9. | Final Project: In this final module, you will be introduced to a hands-on lab where you will complete a graded assignment for cleaning and preparing data, and then analyzing data using an Excel spreadsheet. |
| 10. | Submission of report for final assessment |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Use advanced functions and productivity tools to assist in developing worksheets. |
| CO2 | Manipulate data lists using Outline and PivotTables. |
| CO3 | Use Consolidation to summarise and report results from multiple worksheets. |
| CO4 | Apply Macros and Autofilter to solve the given real world scenario. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. 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 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)

| Component | Scale down to | Total Marks |
|---|---|---|
| Conduction of experiments and Record Writing (Each Experiment evaluated for 10 marks) | 20 | 20 |
| Internal Lab Test 1(After 6 experiments)<br>Exam conduction for 50 marks | 15 | 15 |
| Internal Lab Test 2 (After 6 experiments)<br>Exam conduction for 50 marks | 15 | 15 |
| | **CIE** | **50** |

## SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Students can pick one question (experiment) from the questions lot prepared by the examiners.
4. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
5. Rubrics suggested for SEE, 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.
6. 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 03 hours.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | - | - | 3 | - | - | - | - | - | - | 1 |
| CO2 | 2 | 2 | - | - | 3 | - | - | - | - | - | - | 1 |
| CO3 | 2 | 2 | - | - | 3 | - | - | - | - | - | - | 1 |
| CO4 | 2 | 2 | - | - | 3 | - | - | - | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **SMART URBAN INFRASTRUCTURE**<br>**Category: AEC/SEC-III** | | | | | |
| Course Code | : | B24CV382 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 15(T) | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 1Hrs |

| **Course Objectives** | |
|---|---|
| 1. | Knowing about Urban Infrastructure Systems & their Management |
| 2. | Knowing about Smart Cities Key Concepts |
| 3. | Understand the Transport and Energy Smart Urban Infrastructure and Services |
| 4. | Developing Feasibility Studies for Smart City Services |

| **Module– 1: Introduction to Smart Urban Infrastructures and Smart Cities** | **No. of Hours** |
|---|---|
| Introduction to smart city, Basic concept of developing smart city, Global standards to create smart city. Different conceptual approaches to Smart Cities and discussing the pros and cons of each approach. Smart urban Infrastructure: List of infrastructure facilities, advantages and disadvantages. | 3 |
| **Module– 2: Smart Urban Energy Systems** | **No. of Hours** |
| Introduction to Smart Energy Systems, Government policy and technology. Energy sector to explore some of the most important managerial considerations in the transition phase and operation of Smart Urban Energy Systems. | 3 |
| **Module– 3: Smart Transportation Technologies** | **No. of Hours** |
| Introduction to smart transportation system, Mode of transport systems for smart city, data collection to arrive at best transport facility. Significant opportunities and threads for legacy urban transportation systems. Managerial considerations to facilitate the transition phase, and operation of Smart Urban Transportation Systems | 3 |
| **Module– 4: Towards Smart Cities** | **No. of Hours** |
| Important factors in the transition phase of legacy cities to Smart cities and their managerial implications. | 3 |
| **Module– 5: Towards Smart Cities** | **No. ofHours** |
| Management of Smart Cities calls for different approaches from conventional urban management approaches. The role of city government in the network of actors who play an important role in management of Smart Cities. | 3 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understand the concept of smart city |
| CO2 | Play the role of a civil engineer in providing smart infrastructure |
| CO3 | Design efficient energy system for smart city |
| CO4 | Analyze and design efficient transport system |

| **Text Books** | |
|---|---|
| 1. | Infrastructure for Smart Cities, Dr. R P Rathaliya, Shree Hari Publications, 2021 |

| **Reference Text Books** | |
|---|---|
| 1. | Building Smart Cities, ISBN-13 978-1032340128, by Carol L. Stimmel, 2022 |
| 2. | Smart Cities for Sustainable Development, Ram Kumar Mishra, Ch Lakshmi Kumari, SandeepChachra, P.S. Janaki Krishna, Springer, ISBN-13 978-9811674099, 2022 |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. https://www.coursera.org/learn/smart-cities |

**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 FOR THE THEORY:**

6. Three tests each of 50 marks (Multiple Choice Questions), after the completion of the syllabus 40%, 70% and 100% respectively.
7. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
8. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
9. Total marks scored (30+20 = 50 marks).
10. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

## SEMESTER END EXAMINATION (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | - | 2 | - | - | - | - | - | 1 |
| CO2 | 2 | 2 | 1 | - | 2 | - | - | - | - | - | 1 |
| CO3 | 3 | 3 | 2 | - | 3 | - | - | - | - | - | 1 |
| CO4 | 3 | 3 | 2 | - | 3 | - | - | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **PROBLEM SOLVING WITH PYTHON**<br>**Category: AEC/SEC-III** | | | | | |
| Course Code | : | B24CV383 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 15(T) | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 1Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To understand why Python is a useful scripting language for developers. |
| 2. | To read and write simple Python programs |
| 3. | To learn how to identify Python object types. |
| 4. | To learn how to write functions and pass arguments in Python. |

| **Module– 1:Introduction to Python** | **No. of Hours** |
|---|---|
| Installing Python and Python packages, Managing virtual environments with venv module Introduction to NumPyarrays:Array creation, indexing, data types, broadcasting, copies and views, universal functions, I/O with NumPy | 3 |
| **Module– 2: Introduction to NumPy and SciPy** | **No. of Hours** |
| NumPysubpackages– linalg, fft, random, polynomials, SciPysubpackages– linalg, fftpack, integrate, interpolate, optimize Introduction to Matplotlib: Plotting 2D graphs with Matplotlib, annotations, legend, saving plots to file, bar and pie charts, line plots. | 3 |
| **Module– 3: Linear algebra using NumPy and SciPy** | **No. of Hours** |
| Solving linear simultaneous equations using NumPy and SciPy using numpy.linalg and scipy.linalg – solve, inverse, determinant, least square solution, Linear algebra using NumPy and SciPy (continued): Decomposition using lu and cholesky. Solving eigenvalue problems using NumPy and SciPy:Usingnumpy.linalg and scipy.linalg – eig, eigvals. | 3 |
| **Module– 4: Solving initial value problems for ODE systems using scipy** | **No. of Hours** |
| Integratesubpackage – solve_ivp, RK45, LSODA. Numerical integration of functions using SciPy:Usingscipy.integratesubpackage– Definite integral using Gaussian quadrature – quad and quadrature Numerical integration of fixed samples using scipy.integratesubpackage– Trapezoidal rule trapezoid, Simpson's 1/3 rule using Simpson, Romberg integration romb. | 3 |
| **Module– 5: Determining roots of equations using SciPyusingscipy** | **No. ofHours** |
| Optimizesubpackage– Bisection method bisect, Brent's method brentq, Newton-Raphson method newton. Symbolic computing using SymPy and solving civil engineering problems using SymPy: Introduction, defining symbols, derivatives, integrals, limits, expression evaluation, expression simplification, solving equations, solving differential equations. | 3 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understand Python syntax and semantics and be fluent in the use of Python flow control and functions. |
| CO2 | Demonstrate proficiency in handling Strings and File Systems. |
| CO3 | Represent compound data using Python lists, tuples, Strings, dictionaries. |
| CO4 | Read and write data from/to files in Python Programs |

| **Text Books** | |
|---|---|
| 1. | R. NageswaraRao, "Core Python Programming", dreamtech |

| **Reference Text Books** | |
|---|---|
| 1. | Python Programming: A Modern Approach, VamsiKurama, Pearson |
| 2. | Python Programming , Reematheraja, OXFORD publication |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. NumPy documentation at https://numpy.org/doc/ |
| 2. SciPy documentation at https://docs.scipy.org/doc/scipy/ |
| 3. Matplotlib documentation at https://matplotlib.org/stable/users/index |
| 4. SymPy documentation at https://docs.sympy.org/latest/index.html. |

**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 FOR THE THEORY:**

1. Three tests each of 50 marks (Multiple Choice Questions), after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

## SEMESTER END EXAMINATION (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | 3 | - | - | - | - | - | 1 |
| CO2 | 3 | 2 | - | - | 3 | - | - | - | - | - | 1 |
| CO3 | 3 | 2 | - | - | 3 | - | - | - | - | - | 1 |
| CO4 | 3 | 2 | - | - | 3 | - | - | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-III** | | | | | |
|---|---|---|---|---|---|
| **PERSONALITY DEVELOPMENT FOR CIVIL ENGINEERS**<br>**Category: AEC/SEC-III** | | | | | |
| Course Code | : | B24CV384 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 15(T) | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 1Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To offer placement focused guidance across interview best practices, formal communication, and business etiquette |
| 2. | To give learners a comprehensive understanding of job skills and knowledge that are essential for adapting to changes in workplace |

| **Module– 1: LSRW and Personality Development** | **No. of Hours** |
|---|---|
| Importance of LSRW Skills: Art of listening, Listening comprehension – Art of Speaking – Art of Reading – Reading comprehension – Art of Writing – email writing Personality Development: Emotional Intelligence – Self Awareness – Self Management – Personal SWOT – Manners & Etiquette – Positive Attitude – Confidence building Interpersonal Skills: Active Listening – Motivation – Flexibility – Patience – Dependability – Adaptability – Interpersonal & Intrapersonal skills – Body Language | 3 |
| **Module– 2: NVC, Presentation and Teamwork** | **No. of Hours** |
| Non – Verbal Communication: Body language – Gestures – Postures – Eye contact – Hand Shake – First impression – Proxemics – Facial Expressions Presentation Skills: 4P's of Presentation – Communicating with Credibility – Audience analysis and Building Rapport – Usage of Figures, diagrams & Charts – Presenting with Confidence – Body Language in Presentation Teamwork: What is a Team - Stages of a Team – Benefits of Team work & Collaboration – Group vs Team – Types of Teams – Roles of the Team | 3 |
| **Module– 3: Etiquette and Management** | **No. of Hours** |
| Critical Thinking & Problem Solving: Core Skills – Uses & Importance of Critical Thinking – Principles of Critical Thinking – Facts about Problem Solving – Skills to use in Problem Solving - Problem Solving Process – Barriers to Problem Solving Time Management: Managing your time – Time wasters – Analyzing your Strengths and weakness – Goal Setting – Why Goal Setting is important - SMART Goals – Types of Goals Business Etiquette: Types of Etiquette – Importance of Etiquette – Meeting Etiquette – Office Etiquette – Phone and email Etiquette – Work Place Etiquette | 3 |
| **Module– 4: Leadership** | **No. of Hours** |
| Leadership Skills: What makes an effective Leader – Relationship Building – Leader vs Boss – Decision Making Skills – Innovation & Motivation – Dependability Business Writing – How to improve your Business writing skills – Importance of Business writing – how to write effectively – 5C's of Business writing – 4 types of Business writing Conflict Management: Strategies of Conflict Management – Best practices for Conflict Resolution – 22.07.2023 22.07.2023 @#16032024 2 Stress Management – Learn to say No – Importance of Conflict Management at Work Place | 3 |
| **Module– 5: V GD, Creativity and Psychometry** | **No. ofHours** |
| Group Discussion: Types of GD – Attitude & being Proactive – Time management & how to stick to it – Importance of Listening - Do's & Don'ts Creativity & Innovation: What is Creativity – What is Innovation – Difference between Creativity & Innovation – Categories and misconception of Creativity Psychometric Analysis: What is Psychometric Analysis – Cognitive Skills – Importance of Personality Tests – Personality Profiling | 3 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Use English as a medium of communication in interviews and in any professional working environment proficiently |
| CO2 | Develop necessary skills to Answer common interview questions, express confidence in body language and present with clarity |

| **Text Books** | |
|---|---|
| 1. | Personality Development And Soft Skills, Barun K Mitra, 2nd edition, Oxford University Press, 2016 |

| **Reference Text Books** | |
|---|---|
| 1. | Power of Positive thinking, Norman Vincent Peale, ISBN-13 978-0091906382, RHUK, 2016 |
| 2. | Magic of thinking Big, David J Schwartz, ISBN-13 978-1785040474, Vermilion, 2016 |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. http://acl.digimat.in/nptel/courses/video/109104107/L22.html |
| 2. http://acl.digimat.in/nptel/courses/video/109104107/L22.html |

**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 FOR THE THEORY:**

1. Three tests each of 50 marks (Multiple Choice Questions), after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

## SEMESTER END EXAMINATION (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | - | - | - | - | 1 | 1 | 1 | 1 | 3 | 1 |
| CO2 | 1 | - | - | - | - | 1 | 1 | 1 | 1 | 3 | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

# IV - Semester Syllabus

| SEMESTER-IV | | | | | |
|---|---|---|---|---|---|
| **ENVIRONMENTAL ENGINEERING**<br>**Category:PCC** | | | | | |
| Course Code | : | B24CV401 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | Analyze the variation of water demand and to estimate water requirement for a community. |
| 2. | Study drinking water quality standards and to illustrate qualitative analysis of water. |
| 3. | Analysis of physical and chemical characteristics of water and wastewater. |
| 4. | Understand and design of different unit operations and unit process involved in water and wastewater treatment process |
| 5. | Design various oxidation processes |

| **Module – 1: Introduction** | **No. of Hours** |
|---|---|
| Water: Need for protected water supply, Demand of Water: Types of waterdemands - domestic demand, industrial, institutional and commercial demand, public use and fire demand estimation, factors affecting per capita demand, Variations in demand of water, Peak factor. Design period and factors governing design period. Methods of population forecasting and numerical problems. Physico chemical characteristics of water Sampling. | 9 |
| **Module – 2: Water Treatment, Sedimentation, Filtration** | **No. of Hours** |
| **Water Treatment:** Objectives, Unit flow diagrams – Significance of each unit, Aerationprocess Limitations and types.<br>**Sedimentation** – Theory, settling tanks, types and design with numerical, Coagulation andflocculation, types of coagulants.<br>**Filtration:** Mechanism, theory of filtration, types of filters: slow sand, rapid sand and pressure filters. Operation and cleaning. Design of slow and rapid sand filter without under drainage system, Numerical. | 9 |
| **Module – 3: Disinfection, Wastewater** | **No. of Hours** |
| **Disinfection**: Methods of disinfection with merits and demerits. Breakpoint chlorination,Softening: Lime soda and Zeolite process.<br>**Wastewater: Introduction**: Need for sanitation, methods of sewage disposal, types of sewerage systems, Treatment of municipal waste water: Waste water characteristics sampling, significance and techniques, physical, chemical and biological characteristics, Numerical on BOD. | 9 |
| **Module – 4: Treatment Process, Suspended growth system** | **No. of Hours** |
| **Treatment Process:** flow diagram for municipal waste water Treatment unit operations and process Screens: types, disposal. Grit chamber, oil and grease removal. Primary and secondary settling tanks.<br>**Suspended growth system** - conventional activated sludge process and its modifications, numerical. | 9 |
| **Module – 5: Attached growth system** | **No. of Hours** |
| **Attached growth system** – Trickling filter, numerical on Trickling filters, bio-towers androtating biological contactors. Principle of stabilization ponds, oxidation ditch. Sludge digesters(aerobic and anaerobic), Equalization. Thickeners and drying beds. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Estimate the average and peak water demand for a community. |
| CO2 | Evaluate water quality and environmental significance of various parameters and plan suitable treatment system. |
| CO3 | Design the different units of water treatment plant. |
| CO4 | Design the various units of wastewater treatment plant. |
| CO5 | Design of various AOPs and low cost treatment units. |

| **Text Books** | |
|---|---|
| 1. | S. K. Garg, Environmental Engineering Volume-I, Water supply Engineering – M/s KhannaPublishers, New Delhi2010 |
| 2. | S.K.Garg, "Environmental Engineering vol-II, Water supply Engineering", Khanna Publishers, – New Delhi, 28th edition and 2017 |

| **Reference Text Books** | |
|---|---|
| 1. | Mark.J Hammer, Water & Waste Water Technology, John Wiley & Sons Inc., New York,2008 |
| 2. | Howard S. Peavy, Donald R. Rowe, George T, "Environmental Engineering" - Tata McGraw Hill, New York, Indian Edition, 2013 |
| 3. | Arora K.R, "Surveying", Vol.I& II, Standard Book House, 2009. ISBN 81-89401-23-8 |
| 4. | Karia G.L., and Christian R.A, "Wastewater Treatment Concepts and Design Approach", Prentice Hall of India Pvt. Ltd., New Delhi. 3rd Edition, 2017 |

| **Web links and Video lectures (e-Resources)** |
|---|
| Lecture 01: Background and Course Introduction https://youtu.be/yDnrv-oGSBc<br>Lecture 02: Water Sources and Availability https://youtu.be/K4Vty0cmybI<br>Lecture 03: Water Uses https://youtu.be/9H7dPkWOsjA<br>Lecture 04: Water Supply Key Issues and Concerns https://youtu.be/JueYGPbsflw<br>Lecture 05: Urban water services and water supply systems https://youtu.be/bCKm9KkcQtw<br>Lecture 06: Urban water services and water supply systems https://youtu.be/s0hy0ZlM1bA<br>Lecture 07: Components of Water Demand https://youtu.be/mVmErXpIp64<br>Lecture 08: Fluctuations in Water Demand https://youtu.be/qXUwy5OnX9Q<br>Lecture 09: "Concept of Design Period and Design Population Need to Forecast Population Population Forecasting Methods https://youtu.be/QyLdA_qhUog Lecture 10: Demand Forecasting and Design Capacities |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

## CONTINUOUS INTERNAL EVALUATION (CIE)

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

## SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | - | - | - | - | - | 1 | - | - | - | - |
| CO2 | - | 2 | - | - | - | 1 | - | - | - | - | - |
| CO3 | 1 | 1 | 2 | - | - | 1 | 2 | - | - | - | - |
| CO4 | - | - | - | 2 | - | 2 | - | - | - | - | - |
| CO5 | 1 | - | - | - | - | - | - | - | 2 | - | 2 |

Level 3- High, Level 2- Moderate, Level 1-Low

| **SEMESTER-IV** | | | | | |
|---|---|---|---|---|---|
| **ANALYSIS OF STRUCTURES**<br>**Category: PCC** | | | | | |
| Course Code | : | B24CV402 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To determine slope and deflections in beams and trusses. |
| 2. | To analyse arches and cable structures. |
| 3. | To analyse different structural systems and interpret data using slope deflection method. |
| 4. | To apply matrix operations in analysing structures. |
| 5. | To analyse continuous beams, frames and trusses |

| **Module– 1: Deflection of Beams** | **No. of Hours** |
|---|---|
| Moment area method – Derivation, Mohr's theorems, Sign convention; Application of moment area method to determinate prismatic beams, beams of varying cross section; Use of moment diagram by parts; Conjugate beam method – Real beam and conjugate beam, conjugate beam theorems; Application of conjugate beam method to determinate beams of varying cross sections. | 9 |
| **Module– 2: Energy Principles and Energy Theorems** | **No. of Hours** |
| Principle of virtual displacements; Principle of virtual forces, Strain energy and complementary energy; Strain energy due to axial force, bending shear and torsion; Deflection of determinate beams and trusses using total strain energy; Deflection at the point of application of single point load; Castigliano's theorems, application of Castigliano's theorems to calculate deflection of trusses, frames; Special application – Dummy unit load method. | 9 |
| **Module– 3: Arches and Cables** | **No. of Hours** |
| Three-hinged circular and parabolic arches with supports at the same and different levels; Determination of normal thrust, radial shear and bending moment; Analysisof cables under point loads and UDL; Length of cables with supports at the same and different levels; Stiffening trusses for suspension cables. | 9 |
| **Module– 4: Slope Deflection Method** | **No. of Hours** |
| Introduction, sign convention, development of slope deflection equation; Analysis of continuous beams including settlement of supports; Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy up to 3 | 9 |
| **Module– 5: Matrix Methods of Structural Analysis** | **No. ofHours** |
| Definition of stiffness and flexibility methods, comparison to classical methods.<br>Stiffness Method: Stiffness matrix, Analysis of continuous beams and plane trusses using system approach; Analysis of simple orthogonal plane frames using system approach with kinematic indeterminacy up to 3. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Evaluate slope and deflections in beams using geometrical methods. |
| CO2 | Determine deflections in trusses and frames using energy principles. |
| CO3 | Analyse arches and cables for stress resultants. |
| CO4 | Apply slope defection method in analysing indeterminate structures and construct bending moment diagram. |
| CO5 | Analyse continuous beams, frames and trusses using stiffness matrix method of analysis. |

| **Text Books** | |
|---|---|
| 1. | Reddy, C.S., Basic Structural Analysis, 3rd edition., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2011. |
| 2. | Hibbeler, R.C., Structural Analysis, 9thedition., Pearson publications., New Delhi, 2012. |
| 3. | Thandavamoorthy, T.S., Structural Analysis, 6thedition., Oxford University press., New Delhi,2015. |

| **Reference Text Books** | |
|---|---|
| 1. | Charles Head Norris, John Benson Wilbur and SenolUtku., Elementary Structural Analysis, 4thedition., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2003. |
| 2. | Hall, A. and Kabaila, A.P., Basic Concepts of Structural Analysis, Pitman Publishing, London, John Wiley & |

| | |
|---|---|
| | Sons, New York, 1977. |
| 3. | Wang, C.K., Intermediate Structural Analysis, McGraw-Hill International Book Co., 1985. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. https://nptel.ac.in/courses/105105166 |
| 2. https://nptel.ac.in/courses/105105166 |
| 3. https://nptel.ac.in/courses/105105166 |
| 4. https://nptel.ac.in/courses/105105109 |
| 5. https://nptel.ac.in/courses/105105109 |
| 6. https://nptel.ac.in/courses/105105109 |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 2 | 1 | - | - | - | - | - | 1 |
| CO2 | 3 | 1 | 1 | 2 | 1 | - | - | - | - | - | 1 |
| CO3 | 3 | 1 | 1 | 2 | 1 | - | - | - | - | - | 1 |
| CO4 | 3 | 1 | 1 | 2 | 1 | - | - | - | - | - | 1 |
| CO5 | 3 | 1 | 1 | 2 | 1 | - | - | - | - | - | 1 |

Level 3- High, Level 2- Moderate, Level 1-Low

| SEMESTER-IV | | | | | |
|---|---|---|---|---|---|
| **FLUID MECHANICS AND HYDRAULIC MACHINES**<br>**Category: IPCC** | | | | | |
| Course Code | : | B24CV403 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:2 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) + 15(P) | Total | : | 100 Marks |
| Credits | : | 4 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To gain knowledge on basic properties of fluid and their applications in engineering field. |
| 2. | Explain the concepts and theories used in the fluid flow problems and to apply the concepts in real world. |
| 3. | Establish the relationship among the variables involved in the physical problem by dimensional Analysis. |
| 4. | Understand the losses in pipes, quantifying discharge through notches and weirs. |
| 5. | Working principles and the design criteria of various turbines and pump |

| **Module – 1: Fluids and their properties** | **No. of Hours** |
|---|---|
| Fluids and their properties– compressibility, surface tension, capillarity, Pascal's law, hydrostatic law, fluid pressure measurement using simple and differential manometers, Total pressure and center of pressure on vertical and inclined plane surfaces. | 9 |
| **Module – 2: Kinematics** | **No. of Hours** |
| Kinematics- Types of flow, continuity equation in Cartesian coordinates, velocity potential, stream function, flow nets, Dynamics-Euler's equation of motion, Bernoulli's equation, Application-Venturimeter, Orifice meter, Pitot tube. | 9 |
| **Module – 3: Classification of orifice and mouthpiece** | **No. of Hours** |
| Classification of orifice and mouthpiece, hydraulic coefficients, discharge over rectangular, triangular and Cipoletti notch, Flow through pipes- major and minor losses, pipes in series and parallel, equivalent pipe, concept of water hammer and surge tanks. | 9 |
| **Module – 4: Open channel hydraulics** | **No. of Hours** |
| Open channel hydraulics- classification of flow, Most economical channel sections-rectangular, triangular, trapezoidal, circular, Uniform flow, specific energy-rectangular channels, on-uniform flow, hydraulic jump-equation and applications, GVF equation-types. | 9 |
| **Module – 5: Momentum equation** | **No. of Hours** |
| Momentum equation, impact of jet on stationary and moving curved vanes Turbines-types, Pelton wheel-working proportions, velocity triangles Francis turbine- working proportions, velocity triangles Centrifugal pumps-work done, efficiency, multi-stage pumps. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Apply the concepts of fluid flow in understanding fluid mechanics and hydraulic machines. |
| CO2 | Analyzeandidentify the various types of flows and their relationships in computing the discharge through pipes, notchesand weirs. |
| CO3 | Design the Hydraulic turbines and centrifugal pump. |
| CO4 | Investigate the various fluid flow concepts by conducting experiments. |
| CO5 | Conduct experiments in a team or as an individual having impact for lifelong learning. |

| **Text Books** | |
|---|---|
| 1. | R.K. Bansal- A text book of Fluid Mechanics and Hydraulic Machines- Laxmi Publications, 10$^{th}$Edition, New Delhi. |
| 2. | P.N. Modi and S.M. Seth- Hydraulics and Fluid Mechanics, including Hydraulic machines, Standard Book House, 22$^{nd}$Edition, New Delhi. |
| 3. | K Subramanya- Fluid Mechanics and Hydraulic Machines, Problems and Solutions, Tata McGrawhill, 2$^{nd}$Edition, New Delhi. |
| **Reference Text Books** | |
| 1. | SC Gupta: Fluid Mechanics and Hydraulic Machines – Pearson Education, 1$^{st}$Edition, India. |
| 2. | K R Arora: Hydraulics and Fluid Mechanics, Standard Book House, 1$^{st}$Edition, New Delhi, India. |
| 3. | Victor L. Streeter, Benjamin Wyile E and Keith W. Bedford- Fluid Mechanics, Tata McGraw Hill publishing Co Ltd, 9$^{th}$Edition, New Delhi. |
| 4. | C.S.P. Ojha, R. Berndtsson, and P.N. Chandramouli, "Fluid Mechanics and Machinery", OxfordUniversity Publication, 2010. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. 1. Properties of Fluid: https://youtu.be/-d67xfgJV98<br>2. Hydrostatics: https://youtu.be/lJSUeEqGNY0<br>3. Application of Bernoulli's equation: https://youtu.be/dlsMHsM2V88<br>4. Losses in pipe fittings: https://youtu.be/pZh5_AWvBuU<br>5. Dimensional Analysis: https://youtu.be/zr15T9DUlwU |

## LABORATORY

***Practical Component of IPCC (10 Experiments)***

| Sl. No | Name of the experimewnt |
|---|---|
| 1. | Determination of Cd for Venturimeter&Orificemeter. |
| 2. | Determination of Hydraulic coefficients of a vertical orifice. |
| 3. | Determination of Major Losses in pipes. |
| 4. | Determination of Minor Losses in pipes. |
| 5. | Determination of Cd for Rectangular and Triangular Notch. |
| 6. | Determination of Cd for Ogee and Broad crested Weir. |
| 7. | Determination of force excreted by a jet on flat & curved vanes. |
| 8. | Determination of efficiency of Pelton wheel turbine. |
| 9. | Determination of efficiency of Francis / Kaplan turbine. |
| 10. | Determination of efficiency of Centrifugal pump. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

The CIE marks for the theory component of the Integrated Course (IC) shall be 30 marks and for the laboratory component 20 marks.

## CONTINUOUS INTERNAL EVALUATION (CIE)

**CIE FOR THE THEORY COMPONENT OF IC:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes / Weekly test / project work for (20+20) marks, scaled down to **20 marks.**
4. Total marks scored **(30+20 = 50 marks)** scaled down to **25.**

**CIE FOR THE PRACTICAL COMPONENT OF IC:**

1. On completion of every experiment / program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.

2. Each experiment is evaluated for 10 marks and scaled down to **5 marks.**
3. Laboratory test at the end of the 15th week of the semester / after completion of all the experiments shall be conducted for **50 marks** and scaled down to **20 marks.**
4. Total marks scored for lab component: **05+20=25 marks**.
5. The minimum marks to be secured in CIE to appear for SEE shall be 10(40% of maximum marks 25) in the theory and 10(40% of Maximum marks 25) in the practical.
6. The laboratory component of the **integrated course** shall be CIE only. However, in SEE, the questions from the practical component shall be included.

| **Theory** | | | | |
|---|---|---|---|---|
| **IA Test** | **Exam conducted for** | **Scaled down to** | **Average of best two tests** | **Total** |
| **IA-1** | **50** | **30** | **30** | **50/2=25** |
| **IA-2** | **50** | **30** | | |
| **IA-3** | **50** | **30** | | |
| **Two Assignments** | **2×10=20** | **10** | **10** | |
| **Two Quizzes** | **2×10=20** | **10** | **10** | |

| **LAB** | | | |
|---|---|---|---|
| **Continuous performance and record writing** | **Each experiments evaluated for 10 marks** | **Scaled down to 05 marks** | **5+20=25** |
| **Internal Test + Viva voce** | **Exam conducted for 50 marks** | **Scaled down to 20 marks** | |

## SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. The maximum marks from the practical component to be included in the SEE question paper is **16 marks.**
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | - | - | - | 1 | - |
| CO2 | - | 2 | - | - | - | - | - | - | - | - | - |
| CO3 | 1 | 1 | - | - | - | - | - | - | 1 | - | 1 |
| CO4 | - | - | - | - | - | - | - | - | - | 1 | - |
| CO5 | 1 | 1 | - | - | - | - | - | - | - | 1 | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| SEMESTER-IV | | | | | |
|---|---|---|---|---|---|
| **HIGHWAY ENGINEERING**<br>**Category: IPCC** | | | | | |
| Course Code | : | B24CV404 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:2 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) + 15(P) | Total | : | 100 Marks |
| Credits | : | 4 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | Gain knowledge of different modes of transportation systems and to learn the proposing a new alignment or re-alignment of existing roads. |
| 2. | Get insight to different aspects of geometric elements and train them to design geometric elements of a highway network. |
| 3. | Get insight to different pavement materials and pavement design elements of a highway network |
| 4. | Understand pavement construction activities and its requirements. |
| 5. | Gain the skills of evaluating the highway economics and also introduce the students to highway financing concepts. Realize the significance of Traffic Engineering concepts. |

| **Module – 1:Transportation Systems** | **No. of Hours** |
|---|---|
| Transportation developments in India, modes of transportation, M R Jayakar Committee recommendations, Road Classifications and Road Patterns Highway Alignment: Factors affecting highway alignment, Engineering surveys for alignment conventional and modern methods, new and re-alignment projects | 9 |
| **Module – 2: Highway Geometric Design** | **No. of Hours** |
| Factors affecting geometric design of roads, Cross Sectional Elements, Sight distances, Horizontal alignment- Transition curve, super elevation, Extra widening, Vertical alignment–gradients, summit and valley curves. | 9 |
| **Module – 3: Pavement materials and design** | **No. of Hours** |
| Desirable properties of aggregates, soil subgrade & Bitumen, Application of bituminous emulsion, Desirable properties of Bituminous Mixes Pavement Design: Factors Controlling design of highway pavements, Pavement types, component parts of pavements and their functions; types of joints used in rigid pavement. Critical stresses in flexible and rigid pavement. | 9 |
| **Module – 4: Pavement Construction** | **No. of Hours** |
| Design of soil aggregate mixes by Rothfuch's method. Earthwork; cutting and Filling, Preparation of subgrade, Specification and construction of i) Granular Sub base, ii) WBM Base iii) WMM base, iv) Bituminous Macadam v ) Dense Bituminous Macadam vi) Bituminous Concrete, vii) Dry Lean Concrete sub base and PQC viii) concrete roads.<br>**Highway Drainage:** Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials, Types of cross drainage structures, their choice and location. | 9 |
| **Module – 5: Highway Economics** | **No. of Hours** |
| Highway user benefits, VOC using charts only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method-NPV-IRR methods- Examples, Highway financing-BOT-BOOT concepts.<br>**Traffic Engineering**: Scope, road user characteristics, traffic characteristics, volume studies, speed studies, O & D studies, PCU and highway capacity. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Acquire the knowledge of different modes of transportation system sand capability of proposing a new alignment or re-alignment of existing roads. |
| CO2 | Explain the basic principles of geometric design in the context of transportation engineering and planning. |
| CO3 | Able to interpret the experimental results of highway materials based on laboratory tests and design the pavement as per IRC guidelines. |
| CO4 | Illustrate the various methods in pavement construction and drainage systems. |
| CO5 | Evaluate the highway economics by few select methods and also will have a basic knowledge of various highway financing concepts &analyse traffic data for practical applications. |

| **Text Books** | |
|---|---|
| 1. | S K Khanna and C E G Justo, "Highway Engineering", Nem Chand Bros, Roorkee. |
| 2. | L R Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi. |

| **Reference Text Books** | |
|---|---|
| 1. | Roads, Railways, Bridges, Tunnels and Harbour Dock Engineering by B L Gupta, AmitGupta. |
| 2. | S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing LaboratoryManual", Nem Chand Bros, Roorkee. |

**Web links and Video lectures (e-Resources)**

1.https://nptel.ac.in/courses/105101087
**2.** https://onlinemanuals.txdot.gov/txdotmanuals/rdw/horizontal_alignment.htm#BGBHGEGC
**3.** www.civil.iitb.ac.in/tvm/1111_nptel/567_Grade/plain/plain.html
**4.** https://www.pavementinteractive.org/
**5.** https://www.eng.auburn.edu/research/centers/ncat/research/other-publications.html
**6.** https://nptel.ac.in/courses/105/106/105106203/
**7.** https://nptel.ac.in/courses/105/101/105101008
**8.** https://nptel.ac.in/courses/105/104/105104098
**9.** https://www.classcentral.com/course/edx-intro-to-traffic-flow-modeling-andintelligenttransport-systems-12728
**10.** https://www.aai.aero/
**11.** https://www.faa.gov/
**12.** https://www.icao.int

## LABORATORY

***Practical Component of IPCC***

| Sl. No | Name of the experimewnt |
|---|---|
| 1. | Dtermine the Crushing Strength of the Aggregate |
| 2. | Determine the Impact value of the Aggregate |
| 3. | Determine the shape of Aggrigate |
| 4. | Determine the Penetration of Bitumen |
| 5. | Determine the Ductility of Bitumen |
| 6. | Determine the Softening point of Bitumen |
| 7. | Determine the Specific gravity of Bitumen |
| 8. | Determine the Viscosity test of Bitumen |
| 9. | Determine the Flash and fire point of Bitumen |
| 10. | Determine the CBR value of Soil. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

The CIE marks for the theory component of the Integrated Course (IC) shall be 30 marks and for the laboratory component 20 marks.

## CONTINUOUS INTERNAL EVALUATION (CIE)

**CIE FOR THE THEORY COMPONENT OF IC:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes / Weekly test / project work for (20+20) marks, scaled down to **20 marks.**
4. Total marks scored **(30+20 = 50 marks)** scaled down to **25.**

**CIE FOR THE PRACTICAL COMPONENT OF IC:**

1. On completion of every experiment / program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day.
2. Each experiment is evaluated for 10 marks and scaled down to **5 marks.**
3. Laboratory test at the end of the 15$^{th}$ week of the semester / after completion of all the experiments shall be conducted for **50 marks** and scaled down to **20 marks.**
4. Total marks scored for lab component: **05+20=25 marks**.
5. The minimum marks to be secured in CIE to appear for SEE shall be 10(40% of maximum marks 25) in the theory and 10(40% of Maximum marks 25) in the practical.
6. The laboratory component of the **integrated course** shall be CIE only. However, in SEE, the questions from the practical component shall be included.

| Theory | | | | |
|---|---|---|---|---|
| **IA Test** | **Exam conducted for** | **Scaled down to** | **Average of best two tests** | **Total** |
| **IA-1** | **50** | **30** | **30** | **50/2=25** |
| **IA-2** | **50** | **30** | | |
| **IA-3** | **50** | **30** | | |
| **Two Assignments** | **2×10=20** | **10** | **10** | |
| **Two Quizzes** | **2×10=20** | **10** | **10** | |

| LAB | | | |
|---|---|---|---|
| **Continuous performance and record writing** | **Each experiments evaluated for 10 marks** | **Scaled down to 05 marks** | **5+20=25** |
| **Internal Test + Viva voce** | **Exam conducted for 50 marks** | **Scaled down to 20 marks** | |

## SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. The maximum marks from the practical component to be included in the SEE question paper is **16 marks.**
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | - | - | 2 | - | 1 |
| CO2 | - | - | - | - | - | 2 | - | - | - | - | 1 |
| CO3 | 1 | 2 | - | - | - | - | - | - | 2 | - | 2 |
| CO4 | - | 1 | - | - | - | 2 | - | - | - | - | - |
| CO5 | 1 | - | - | - | - | - | - | - | 1 | - | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| SEMESTER-IV | | | | | |
|---|---|---|---|---|---|
| **ENVIRONMENTAL ENGINEERING LABORATORY**<br>**Category: PCCL** | | | | | |
| Course Code | : | B24CV405L | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 0 : 0 : 2 | SEE | : | 50 Marks |
| Total Hours | : | 15(P) | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To learn different methods of water & waste water quality. |
| 2. | To conduct experiments to determine the concentration soft water and waste water. |
| 3. | To determine the degree and type of treatment. |
| 4. | To understand the environmental significance and application in environmental engineering practice. |

| **Sl. No** | **List of Experiments** |
|---|---|
| 1. | Preparation chemical solutions required for analysis and sampling methodologies. |
| 2. | Determination of pH, Conductivity, TDS and Turbidity. |
| 3. | Determination of Acidity and Alkalinity. |
| 4. | Determination of Calcium, Magnesium and Total Hardness. |
| 5. | Determination of Dissolved Oxygen. |
| 6. | Determination of BOD. |
| 7. | Determination of Chlorides. |
| 8. | Determination of percentage of % of available chlorine in bleaching powder sample, Determination of Residual Chlorine and chlorine demand. |
| 9. | Determination of Solids in Sewage: i)Total Solids, ii)Suspended Solids, iii)Dissolved Solids, iv)Volatile Solids, Fixed Solids, v)Settleable Solids. |
| 10. | Determination of optimum coagulant dosage using Jartest apparatus. |
| 11. | Determination Nitrates and Iron by spectrophotometer |
| 12. | Determination of COD(Demonstration) |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Acquire capability to conduct experiments and estimate the concentration of different parameters. |
| CO2 | Compare the result with standards and discuss based on the purpose of analysis. |
| CO3 | Determine type of treatment, degree of treatment for water and wastewater. |
| CO4 | Identify the parameter to be analyzed for the student project work in environmental stream. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. 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 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)

| Component | Scale down to | Total Marks |
|---|---|---|
| Conduction of experiments and Record Writing (Each Experiment evaluated for 10 marks) | 20 | 20 |
| Internal Lab Test 1(After 6 experiments)<br>Exam conduction for 50 marks | 15 | 15 |
| Internal Lab Test 2 (After 6 experiments)<br>Exam conduction for 50 marks | 15 | 15 |
| | **CIE** | **50** |

## SEMESTER END EXAMINATION(SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Students can pick one question (experiment) from the questions lot prepared by the examiners.
4. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
5. Rubrics suggested for SEE, 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.
6. 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 03 hours.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | - | - | 1 | 1 | - | - | - | 1 |
| CO2 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | 1 |
| CO3 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 |
| CO4 | 2 | 1 | 1 | - | - | - | - | - | - | - | 1 |

Level 3- High, Level 2- Moderate, Level 1-Low

| **SEMESTER-IV** | | | | | |
|---|---|---|---|---|---|
| **ALTERNATIVE BUILDING MATERIALS**<br>**Category: ESC/ETC/PLC-IV** | | | | | |
| Course Code | : | B24CV461 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3Hrs |

| **Course Objectives** | |
|---|---|
| 1. | understand environmental issues due to building materials and the energy consumption in manufacturing building materials |
| 2. | Study the various masonry blocks, masonry mortar and structural behavior of masonry under compression. |
| 3. | Study the alternative building materials in the present context. |
| 4. | Understand the alternative building technologies which are followed in present construction field. |

| **Module– 1: Environmental Implications of Buildings** | **No. of Hours** |
|---|---|
| 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.BUILDINGS 9 Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings. | 9 |
| **Module– 2: Elements of Structural Masonry** | **No. of Hours** |
| Elements of Structural Masonry, Masonry materials, requirementsof masonry units' characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, lateriteBlocks, Fal- G blocks and Stabilized mud block. Manufacture of stabilized blocks.<br>**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. | 9 |
| **Module– 3: Alternate Building Materials** | **No. of Hours** |
| 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, Bamboo as a reinforced material. | 9 |
| **Module– 4: Alternate Building Technologies** | **No. of Hours** |
| 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.<br>**Alternate Roofing Systems:** Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes. | 9 |
| **Module– 5: Equipment for Production of Alternate Materials** | **No. ofHours** |
| Machines for manufacture of concrete, Equipments 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. | 9 |

**Course Outcomes**: At the end of the course, the students will be able to

| | |
|---|---|
| CO1 | Solve the problems of Environmental issues concerned to building materials and cost effective building technologies |
| 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. |
| CO3 | Analyze different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of suggesting suitable agro and industrial wastes as a building material. |
| CO4 | Recommend various types of alternative building materials and technologies and design a energy efficient building by considering local climatic condition and building material. |

| **Text Books** | |
|---|---|
| 1. | KS Jagadish, B V Venkatarama Reddy and K S NanjundaRao, "Alternative BuildingMaterials and Technologies", New Age International pub. |
| 2. | Arnold W Hendry, "Structural Masonry", Macmillan Publishers |

| **Reference Text 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)** |
|---|
| 1. http://www.digimat.in/nptel/courses/video/105102088/L20.html |
| 2. http://www.digimat.in/nptel/courses/video/105102195/L08.html |
| 3. http://kcl.digimat.in/nptel/courses/video/105102195/L44.html |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | - | 1 | 2 | 1 | 1 | - | - | - | 2 |
| CO2 | 1 | 1 | - | 1 | 2 | 1 | 1 | - | - | - | 2 |
| CO3 | 1 | 1 | - | 1 | 2 | 1 | 1 | - | - | - | 2 |
| CO4 | 1 | 1 | - | 1 | 2 | 1 | 1 | - | - | - | 2 |

Level 3- High, Level 2- Moderate, Level 1-Low

| **SEMESTER-IV** | | | | | |
|---|---|---|---|---|---|
| **RURAL, URBAN PLANNING AND ARCHITECTURE**<br>**Category: ESC/ETC/PLC-IV** | | | | | |
| Course Code | : | B24CV462 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To make the student understand about the past and present architecture of different partsof the world |
| 2. | Rural and urban planning and growth and circulation of patterns and effect of increase inurbanization |
| 3. | The basic planning required for urban and rural centers with respect to physical and socialaspects |
| 4. | Student s to visit the different place of architecture monuments to understand the concept. |

| **Module– 1: Introduction** | **No. of Hours** |
|---|---|
| Introduction: Aim and importance of Architecture, Architecture as a fine art. Role of an architect and an engineer. Essential principles and qualities of architecture with examples<br>**Factors of architecture:** Mass, Form, Color, Solids, and Voids, Uniformity, Balance and Symmetry, Painting with examples. | 9 |
| **Module– 2: Architectural influence** | **No. of Hours** |
| Architectural influence of the following: Association, Tradition, Climate, Materials, Topography, Religion social customs and aspiration of time. Architectural characteristics of the following architecture with examples. 1. Egyptian, 2. Greek, 3. Roman, 4. Buddhist, 5. Hindu, 6. Jain, 7. Chalukyan, 8. Modern architecture Factors that have influence present day Modern Architecture, Aesthetic difference between the past and present Architecture. Students are advised for a technical tour related Architecture and town planning to gain additional knowledge in this subject | 9 |
| **Module– 3: Ancient Town Planning in India** | **No. of Hours** |
| Human settlements, Rural and urban pattern of growth, Factors that promote growth anddevelopment of Rural and urban areasAncient Town Planning in India: Principles of town planning and circulation pattern withexamples | 9 |
| **Module– 4: Industrialization** | **No. of Hours** |
| Industrialization: Impact on town planning, Urbanization causes, its effect on town and cities, remedial measures both in urban and rural planning.<br>**Circulation pattern in cities:** Urban roads and streets, their fuctional classification, traffic survey data and its use in town planning. | 9 |
| **Module– 5: Contemporary objectives and methods of planning of town** | **No. ofHours** |
| Contemporary objectives and methods of planning of town: Development plans for cities, objectives and stages involved in their preparation and implementation, space standards for planning. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understand importance of architecture in rural and urban planning |
| CO2 | Understand Influence of architecture |
| CO3 | Design infrastructure for rural and urban region |
| CO4 | Plan and design rural and urban roads |

| **Text Books** | |
|---|---|
| 1. | History of Architecture – Fletcher |
| 2. | Urban pattern – Galliaon |

| **Reference Text Books** | |
|---|---|
| 1. | Indian architecture – Vol. I & II – Perey Brown |
| 2. | Principle of town and country planning – Lewis Keeble |
| 3. | Urbanization and Urban Syatems in India, Ramachandran R, Oxford University Press, New Delhi. |
| 4. | Town planning – Rangwala, Charothar Publication |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. http://acl.digimat.in/nptel/courses/video/124107158/L26.html |
| 2. http://kcl.digimat.in/nptel/courses/video/124107158/L10.html |
| 3. http://kcl.digimat.in/nptel/courses/video/124107158/L02.html |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

## CONTINUOUS INTERNAL EVALUATION (CIE)

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

## SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - | - | 1 |
| CO2 | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - | - | 1 |
| CO3 | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - | - | 1 |
| CO4 | 1 | 1 | - | 1 | 1 | 1 | 1 | - | - | - | 1 |

Level 3- High, Level 2- Moderate, Level 1-Low

| **SEMESTER-IV** | | | | | |
|---|---|---|---|---|---|
| **WATERSHED MANAGEMENT**<br>**Category: ESC/ETC/PLC-IV** | | | | | |
| Course Code | : | B24CV463 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To understand Watershed Hydrology |
| 2. | To estimate water demand and learn, water conservation methods |
| 3. | To understand application of Remote Sensing and GIS in watershed management |
| 4. | To apply sustainable measures for watershed management |
| 5. | To apply modern tools in watershed management. |

| **Module– 1: Principles of Watershed Management** | **No. of Hours** |
|---|---|
| **Principles of Watershed Management:** Basics concepts, hydrology and water availability, surface water, ground water, conjunctive use, human influences in the water resources system. | 9 |
| **Module– 2: Water resources systems** | **No. of Hours** |
| **Water resources systems:** Integrated water resources system, river basins-morphometric analysis of watersheds for watershed management, watershed management practices in arid and semi-arid regions, watershed management through wells, management of water supply, short term and long-term strategic planning. | 9 |
| **Module– 3: Conservation of Water** | **No. of Hours** |
| **Conservation of Water:** Perspective on recycle and reuse, wastewater reclamation, social aspects of watershed management and community participation, private sector participation, institutional issues, socio-economy, integrated development, water legislation and implementations, case studies.<br>**Water Harvesting:** Rainwater management, conservation, storage and effective utilization of rainwater, structures for rainwater harvesting, roof catchments system, check dams, aquifer storage. | 9 |
| **Module– 4: Sustainable Watershed Approach** | **No. of Hours** |
| **Sustainable Watershed Approach:** Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, soil erosion and conservation. | 9 |
| **Module– 5: Applications of RS and GIS in Watershed management** | **No. ofHours** |
| **Applications of RS and GIS in Watershed management:** Role of decision support system in watershed management, watershed characteristics of coastal regions, coastal aquifer tor management, uniqueness of coastal water resources. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Discuss surface and ground water resources system and, human influences. |
| CO2 | Integrate water resources system in arid and semi-arid regions and explain watershed aquifer for management. |
| CO3 | Analyse water resources related issues for conservation and synthesize augmentation of water resources. |
| CO4 | Design integrated watershed management system. |
| CO5 | Apply modern tools in watershed management. |

| **Text Books** | |
|---|---|
| 1. | Singh Vir, Raj., "Watershed Planning and Management", Yash Publishing House, Bikaner.3rdRevised Edition, 2016. |
| 2. | Murthy, J. V. S., "Watershed Management in India", New Age Publishers, New Delhi. 2nd Edition,2017. |
| **Reference Text Books** | |
| 1. | "Decision Support System for Integrated Watershed Management", Colorad State University.2012. |
| 2. | Tideman, E. M., "Watershed Management", Omega Scientific Publishers, New Delhi, 2002 |

| **Web links and Video lectures (e-Resources)** |
|---|

1. https://www.youtube.com/watch?v=wkPu4LwRKro
2. https://youtu.be/wkPu4LwRKro
3. https://youtu.be/wkPu4LwRKro
4. https://youtu.be/wkPu4LwRKro

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | - | - | - | - | - | 2 | - | - | - | 1 |
| CO2 | 1 | - | - | - | - | - | 1 | - | - | - | 1 |
| CO3 | 2 | 1 | - | - | - | - | 1 | - | - | - | 1 |
| CO4 | 3 | 3 | - | - | - | - | 1 | - | - | - | 1 |
| CO5 | 1 | - | - | - | - | - | 2 | - | - | - | 1 |

Level 3- High, Level 2- Moderate, Level 1-Low

| SEMESTER-IV | | | | | |
|---|---|---|---|---|---|
| **FINANCE FOR PROFESSIONALS**<br>**Category: ESC/ETC/PLC-IV** | | | | | |
| Course Code | : | B24CV464 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 3:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 45(T) | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To give learners an overview of finance and develop their finance sense |
| 2. | To comprehend financial acumen and tools to optimize outcomes |

| **Module– 1: Economics** | **No. of Hours** |
|---|---|
| Economics: Introduction to economics, Economic policies, Role of monetary policy inmanaging the economy | 9 |
| **Module– 2: Finance Vocabulary and Financial Statements** | **No. of Hours** |
| Finance Vocabulary and Financial Statements: Unique role of finance, Unique role of finance example, Accounting, finance & auditing, Capital vs. revenue, Capital vs. revenue example, Sources & uses of funds, Sources & uses of funds example, Revenue recognition principles, Double entry bookkeeping, Illustration of double entry book keeping, Understanding profit & loss, Understanding profit & loss example, Profit and profitability, Profit and profitability example 1, Profit and profitability example 2 | 9 |
| **Module– 3: Financial Statement and Risk Analysis** | **No. of Hours** |
| Financial Statement and Risk Analysis: Finance metrics & financial statement analysis,<br>Finance metrics & financial statement analysis example, understanding liquidity, understanding liquidity example, Funds flow analysis, Example of funds flow analysis, Cash flow analysis, Example of cash flow analysis, Introduction to risk management, understanding risk management example, Management of risk, understanding risk management measurement example, Understanding risk management products example, Holistic look at risk management. | 9 |
| **Module– 4: Time Value of Money** | **No. of Hours** |
| Time Value of Money: Time value of money, understanding time value of money, understanding financial functions, Applications of time value of money, Capital structure, Capital structure example, Cost of capital, Cost of capital example, Capital budgeting, Understanding capital budgeting - example | 9 |
| **Module– 5: Personal Finance** | **No. ofHours** |
| Personal Finance: Financial Instrument, Approaches to investing, Ratios for investment,Portfolio management principles, Example of portfolio, forming a portfolio, Forming a portfolio example | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understand how their work and effort contribute to organizational financial performance |
| CO2 | Comprehend financial acumen and tools to optimize outcomes |

| **Text Books** | |
|---|---|
| 1. | Financial Management: Theory & Practice \| 11$^{th}$Edition by Prasanna Chandra |
| 2. | International Financial Reporting Standards (Bangalore Univ) |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. E-learning content on L&T EduTech Platform.<br>2. http://www.digimat.in/nptel/courses/video/110107144/L06.html<br>3. http://www.digimat.in/nptel/courses/video/110105057/L01.html |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

## CONTINUOUS INTERNAL EVALUATION (CIE)

**CIE FOR THE THEORY:**

1. Three tests each of 50 marks, after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

## SEMESTER END EXAMINATION (SEE)

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part –A and Part – B.
3. **Part - A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 mark each. **Part - A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | - | - | 1 | 1 | 1 | 1 | - | - | - | 3 |
| CO2 | 2 | - | - | 1 | 1 | 1 | 1 | - | - | - | 3 |

Level 3- High, Level 2- Moderate, Level 1-Low

| **SEMESTER-IV** | | | | | |
|---|---|---|---|---|---|
| **BUILDING SERVICES**<br>**Category: AEC/SEC-IV** | | | | | |
| Course Code | : | B24CV481 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 15(T) | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 1Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To understand different types of services provided in the building |
| 2. | To gain knowledge about the building services and layout as per the building. |
| 3. | To learn about the various methods of maintenance in construction industry. |
| 4. | To choose the appropriate type of maintenance depending upon necessity and requisite budget |

| **Module– 1: Introduction to Building Services** | **No. of Hours** |
|---|---|
| Definition of building services. Classification of building services. Introduction to Fire and Life safety: causes of fire, fire classification of buildings, fire water storage requirements, fire control room and code of practices. | 3 |
| **Module– 2: Electrical services in the building** | **No. of Hours** |
| Technical terms and symbols for electrical installations, electrical layout of building (ex- residence, small work shop, show room, school building) and Type of cold and hot water systems. | 3 |
| **Module– 3: Lifts and Escalators** | **No. of Hours** |
| Definition and types of lifts and escalators, location and sizes as per NBC 2005, different type of conveyors. | 3 |
| **Module– 4: Need for maintenance** | **No. of Hours** |
| objectives, types of maintenance, factors influencing maintenance, Agencies causing deterioration. | 3 |
| **Module– 5: Building Maintenance** | **No. ofHours** |
| common building defects and their Symptoms (identifying the cracks in structures), preventive and remedial measures for defects in building components, developing a repair budget. | 3 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Manage the building services provisions in big construction sites. |
| CO2 | Select the suitable electrical as well mechanical services for the given requirements of structures. |
| CO3 | Synchronize the construction activities with installation of building services |
| CO4 | Choose the appropriate type of maintenance depending upon necessity and requisite budget. |

| **Text Books** | |
|---|---|
| 1. | S. M. Patil “Building Services” Seema Publication, Mumbai Revised 2nd edition. ISBN no : 8175259805 |
| 2. | R. Udaykumar “Building Services” „Eswar Press -Chennai , ISBN NO-9788178740638 |
| 3. | NBC” Relevant Parts: BIS New Delhi,ISBN NO-81-7061-026-5 |
| **Reference Text Books** | |
| 1. | 1. Jain V K,” Services in Building Complex and High Rise Buildings”, Khanna Publishers, ISBN NO-. 978-81-7409-245-8 |

| **Web links and Video lectures (e-Resources)** |
|---|
| http://civildigital.com/pavement-design-road-construction-designparameters/<br>http://civildigital.com/pavement-design-examples/ |

**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 FOR THE THEORY:**

1. Three tests each of 50 marks (Multiple Choice Questions), after the completion of the syllabus 40%, 70% and 100% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

## SEMESTER END EXAMINATION (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | 3 | - | - | - | - | - | 1 |
| CO2 | 3 | 2 | - | - | 3 | - | - | - | - | - | 1 |
| CO3 | 3 | 2 | - | - | 3 | - | - | - | - | - | 1 |
| CO4 | 3 | 2 | - | - | 3 | - | - | - | - | - | 1 |

Level 3- High, Level 2- Moderate, Level 1-Low

| SEMESTER-IV | | | | | |
|---|---|---|---|---|---|
| **BUILDING INFORMATION MODELLING IN CIVIL ENGINEERING – BASICS**<br>**Category: AEC/SEC-IV** | | | | | |
| Course Code | : | B24CV482 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 0 : 0 : 2 | SEE | : | 50 Marks |
| Total Hours | : | 15(P) | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Objectives** | |
|---|---|
| 1. | Understand the concept of Building Information Modelling |
| 2. | Create the workflow followed in industry during creation of BIM 3D model which includes |
| 3. | Building the discipline-based model and create the federated models |

| **Sl. No** | **Exercise** |
|---|---|
| 1. | Introduction Building Information Modelling |
| 2. | Revit Projects: Project Templates, Revit File Types Working with Revit Elements andFamilies Exploring the User Interface Starting a Project |
| 3. | Setting Up Levels and Grids (Datum Planes) Setting up Levels & Modifying Creating Grids |
| 4. | Modelling Walls Creating Walls Modify wall types |
| 5. | Working with Doors and Windows Loading Door and Window Types from the LibraryCreating Additional Door and Window Sizes |
| 6. | Using Editing Tools & Working with Views: Using Editing Commands Setting the viewdisplay Visibility Graphics, Duplicate Views Elevations &Sections , Adding Callout Views Creating and Modifying 3D Views |
| 7. | Modelling Floors Creating and Modifying Floors |
| 8. | Modelling Stairs, Railings, and Ramps Creating & Modifying Stairs Working with RailingsSketching Custom Stairs Creating Ramps |
| 9. | Modelling Roofs Creating Roofs by Footprint Using Join & unjoin roof |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Prepare, read and interpret the drawings in a professional set up. |
| CO2 | Know the procedures of submission of drawings and Develop working and submission drawings for building. |
| CO3 | Plan of residential or public building as per the given requirements with details |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. 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 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)

| Component | Scale down to | Total Marks |
|---|---|---|
| Conduction of experiments and Record Writing (Each Experiment evaluated for 10 marks) | 20 | 20 |
| Internal Lab Test 1(After 6 experiments)<br>Exam conduction for 50 marks | 15 | 15 |
| Internal Lab Test 2 (After 6 experiments)<br>Exam conduction for 50 marks | 15 | 15 |
| | **CIE** | **50** |

## SEMESTER END EXAMINATION (SEE)

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Students can pick one question (experiment) from the questions lot prepared by the examiners.
4. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
5. Rubrics suggested for SEE, 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.
6. 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 03 hours.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | - | - | 2 | 1 | - | - | - | - | 1 |
| CO2 | 2 | 2 | - | - | 1 | - | - | - | - | - | 1 |
| CO3 | 2 | 2 | - | - | 2 | 1 | - | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **SEMESTER-IV** | | | | | |
|---|---|---|---|---|---|
| **ELECTRONIC WASTE MANAGEMENT - ISSUES AND CHALLENGES**<br>**Category: AEC/SEC-IV** | | | | | |
| Course Code | : | B24CV483 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 15(T) | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 1Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To provide students with a comprehensive understanding of e-waste and its impact on the environment. |
| 2. | To familiarize students with the generation, composition, and hazardous components of e-waste. |
| 3. | To highlight the health and environmental risks associated with improper e-waste management. |
| 4. | To introduce students to various methods of e-waste collection, recycling, and disposal. |
| 5. | To develop an understanding of the relevant policies and regulations governing e-waste management in India. |

| **Module– 1** | **No. of Hours** |
|---|---|
| Introduction to E-Waste Management, Overview of e-waste and its impact on the environment. | 3 |
| **Module– 2** | **No. of Hours** |
| E-Waste Generation and Composition, Types of e-waste and their components | 3 |
| **Module– 3** | **No. of Hours** |
| E-Waste Hazards and Environmental Impacts, Health and environmental risks associated with E-waste | 3 |
| **Module– 4** | **No. of Hours** |
| E-Waste Collection and Recycling, Methods of e-waste collection, recycling, and disposal | 3 |
| **Module– 5** | **No. ofHours** |
| E-Waste Management Policies and Regulations, Relevant laws, policies, and regulations in India | 3 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Explain the concept of e-waste and its significance in the context of environmental sustainability. |
| CO2 | Identify and classify different types of e-waste and describe their components. |
| CO3 | Recognize the potential health and environmental hazards associated with improper e-waste management. |
| CO4 | Evaluate and apply appropriate methods for the collection, recycling, and disposal of e-waste. |
| CO5 | Demonstrate knowledge of the existing policies, regulations, and frameworks for e-waste management in India |

| **Text Books** | |
|---|---|
| 1. | "E-Waste Management: From Waste to Resource" by R. K. Rathore and H. N. Chanakya, TERI Press, 2019 |
| 2. | "E-Waste in India: An Emerging Crisis" by Sangeeta Sharma, Cambridge Scholars Publishing, 2019 |

| **Reference Text Books** | |
|---|---|
| 1. | "E-Waste Management: Research, Technology, and Applications", MajetiNarasimhaVara Prasad, CRCPress, 2016 |
| 2. | "Electronic Waste Management and Treatment Technology" by RezaulBegg, R. M. Sarcar, and R. V. R. Singh, Springer, 2018 |
| 3. | "E-Waste Management: From Waste to Resource" by Florin-ConstantinMihai, Academic Press, 2018 |

| **Web links and Video lectures (e-Resources)** |
|---|
| • NPTEL video Lectures |

**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 FOR THE THEORY:**

1. Three tests each of 50 marks (Multiple Choice Questions), after the completion of the syllabus 40%, 70% and 80% respectively.
2. Average of best two internal assessment tests each of 50 marks, scale down to 30 marks.
3. Any two assessment methods as per regulations i.e. Two assignments / Two Quizzes/ Weekly test / project work for 40 marks, scaled down to 20 marks.
4. Total marks scored (30+20 = 50 marks).
5. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50).

## SEMESTER END EXAMINATION (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 3 | 1 | 1 | - | - | - | 1 |
| CO2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | - | 1 |
| CO3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - | 1 |
| CO4 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | - | - | - | 1 |
| CO5 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| SEMESTER-IV | | | | | |
|---|---|---|---|---|---|
| **GIS WITH QGIS**<br>**Category:AEC/SEC-IV** | | | | | |
| Course Code | : | B24CV484 | CIE | : | 50 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | 50 Marks |
| Total Hours | : | 15(T) | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 1Hrs |

| **Course Objectives** | |
|---|---|
| 1. | To learning the open source QGIS software for Civil Engineering applications |
| 2. | To understand raster and vector data |
| 3. | Creation of base map and thematic maps for specific application |
| 4. | To generate maps for decision making |

| **Module– 1** | **No. of Hours** |
|---|---|
| QGIS Introduction: Definition of GIS and its use. Introduction to a free and open sourcedesktop geographic information system software. Types of data (vector and raster formats), web services, useful commands and utilities for geo-processing, extending its capabilities to digital satellite image processing and analysis | 3 |
| **Module– 2** | **No. of Hours** |
| INTRODUCTION IN QGIS About QGIS Characteristics of QGIS Start using QGIS. QGIS TOOLS QGIS Configuration, General tools, Working with projections QGIS Browser. WORKING WITH RASTER DATA Introduction, Display raster data, Raster calculator, Working with images, Practical exercises: Working with raster data and operations with | 3 |
| **Module– 3** | **No. of Hours** |
| QGIS PLUGINS Additional modules of QGIS or “plugins” Description of Plugins incorporated in QGIS Operations through “plugins” Practical exercises: Different QGIS “plugins” and their applications: GDAL library tool, georeferencing, coordinate capture, format converter. | 3 |
| **Module– 4** | **No. of Hours** |
| CREATE MAPS AND RELATED PRODUCTS: Creation tools, Graphic elements, Atlasesgeneration, and Graphic output creations. Practical exercises: Map creation with QGIS. | 3 |
| **Module– 5** | **No. of Hours** |
| RELATIONAL DATABASE MANAGEMENT SYSTEMS AND SPATIAL DATA. Database design, Database connections, Table joins Spatial joins, generate new statistics and new data using table and spatial data information. Practical exercises: Creation of thematic maps like population data of taluk, Watershed map with drainage and water bodies, Highway with other 2 road intersection details | 3 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Use open source software for civil engineering applications |
| CO2 | Various tools in QGIS software |
| CO3 | Create thematic layers with attribute data |
| CO4 | Generate maps for decision making |

| **Text Books** | |
|---|---|
| 1. | Geographic Information System-An Introduction, Tor Bernharadsen, 2009, 3rd Edition,Wiley India Pvt. Ltd. New Delhi, ISBN - 9788126511389. |

| **Reference Text Books** | |
|---|---|
| 1. | Principles of Remote sensing and Image Interpretation, Lillesand and Kiefer, 2011, 6th Edition, John Wiley Publishers, New Delhi, ISBN – 8126532238 |

| **Web links and Video lectures (e-Resources)** |
|---|
| • https://docs.qgis.org/3.16/pdf/en/QGIS-3.16-DesktopUserGuide-en.pdf for QGIS manual<br>• NPTEL Lectures. |

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## SEMESTER END EXAMINATION (SEE)

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**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | - | - | 3 | - | 2 | - | - | - | 1 |
| CO2 | 3 | | - | - | 3 | - | 2 | - | - | - | 1 |
| CO3 | 3 | | - | - | 3 | - | 2 | - | - | - | 1 |
| CO4 | 3 | | - | - | 3 | - | 2 | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low