



**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**  
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



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**Department of Civil Engineering**  
**S. Y. B. Tech (2019 Pattern)**  
**w.e.f. Academic Year 2020-2021**

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| Sr.                                            | Subject Code | Title                                       |
|------------------------------------------------|--------------|---------------------------------------------|
|                                                |              | Vision And Mission Of The Department        |
|                                                |              | Program Outcomes                            |
|                                                |              | Program Specific Outcomes                   |
|                                                |              | Unique features of the curriculum           |
|                                                |              | Course Structure                            |
| <b>Course Content of S.Y. B.Tech (Sem-III)</b> |              |                                             |
| 1                                              | ES2101       | Engineering Mathematics-III                 |
| 2                                              | CE2101       | Solid Mechanics                             |
| 3                                              | CE2102       | Building Materials and Construction         |
| 4                                              | CE2103       | Surveying & Geomatics                       |
| 5                                              | CE2104       | Geotechnical Engineering-I                  |
| 6                                              | CE2105A      | Professional Practices in Civil Engineering |
| 7                                              | CE2105B      | Problem Based Experiential Learning         |
| 8                                              | HS2101       | Language Proficiency –II (English)          |
| 9                                              | HS2102       | Language Proficiency –II (German)           |
| 10                                             | HS2103       | Language Proficiency –II (Japanese)         |
| 11                                             |              | Audit Course-I                              |
| <b>Course Content of S.Y. B. Tech (Sem-IV)</b> |              |                                             |
| 12                                             | CE2107       | Fluid Mechanics                             |
| 13                                             | CE2108       | Analysis of Structure I                     |
| 14                                             | CE2109       | Engineering Geology                         |
| 15                                             | CE2110       | Concrete Technology                         |
| 16                                             | CE2111       | Building Planning and Architecture          |
| 17                                             | CE2112A      | Professional Practices in Civil Engineering |
| 18                                             | CE2112B      | Problem Based Experiential Learning         |
| 19                                             | HS2104       | Human Values and Ethics                     |
| 20                                             |              | Audit Course-II                             |



## Department of Civil Engineering

### Vision

“To provide an excellent academic environment for students to become competent Civil Engineer.”

### Mission

- To reinforce the students with fundamentals in Civil Engineering by providing scholarly and vibrant environment for successful careers.
- To explore and develop innovations that contributes to higher education, research and entrepreneurship development in applied domains of Civil Engineering.
- To serve society through knowledge and expertise in Civil Engineering.



### *Civil Engineers: Trusted Leaders for a Modern World:*

*Entrusted by society* to create a *sustainable world* and enhance the global quality of life, *civilengineers* serve *competently*, *collaboratively*, and *ethically* as *master*:

- *Planners, designers, constructors*, and *operatorsofsociety'seconomic* and *socialengine*—the built environment
- *Stewards* of the natural environment and its resources
- *Innovators* and *integrators* of *ideas* and *technology* across the public, private, and academic sectors
- *Managers* of *risk* and *uncertainty* caused by natural events, accidents, and other threats and
- *Leaders* in *discussions* and *decisions* shaping public environmental and infrastructure policy.



## Department of Civil Engineering

### Program Outcomes (POs)

Engineering Graduates will be able to:

**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### Program Specific Outcomes (PSOs):

Upon successful completion of UG course in Civil Engineering, the students will attain following Program Specific Outcomes:

1. Satisfy the essentials in planning, analysis, design and maintenance of Civil Engineering Structures by incorporating latest technologies and modern tools.
2. Proficient in identifying and solving complex infrastructural problems, applying management and engineering techniques.
3. Provide sustainable solutions to environmental and water resources challenges



## Unique features of the curriculum

### 1. Curriculum centered at Outcome Based Education:

The new Curriculum is based on student-centered instruction models that focus on measuring student performance through outcomes. The outcomes include subject knowledge, industry required skills and attitudes.

### 2. Emphasize on Fundamentals:

The nature of the new curriculum is rigorous and well prescribed so that the students can spend more time on preparation and self-study. The students have to learn core subjects, solve practical based assignments and must attempt periodical quizzes. This will benefit them to grasp and keep a strong hold on fundamentals of Engineering in the most effective way.

### 3. Experiential Learning:

The curriculum emphasizes on hands-on sessions along with theoretical information. The new curriculum considers Problem Based Learning (PBL) as a teaching pedagogy and includes different subjects that encourage the students for hands on learning through virtual labs, mini-projects, etc. Accordingly, the curriculum maintains good balance between theory and laboratory credits.

### 4. Promote Creativity and Innovation:

Along with experiential learning, the curriculum also motivates the students to inculcate creativity and innovation. Apart from conventional lab, the curriculum provides a freedom for students to perform industry assignments, pilot projects, innovative development, etc.

### 5. Inculcating Ethics and Values:

To improvise student's behaviour, the curriculum has included systematic courses on ethics and values. The moral principles can help students to make right decisions, lead their professional lives and become ethical citizen.

### 6. Blend of Curricular and Noncurricular Activities

The curriculum also gives importance of different activities like co-curricular, extra-curricular, sports, culture, etc. This will help to do all round development of students in all possible ways.

### 7. Four Tracks in B-Tech:

The curriculum provides four tracks by offering various courses/electives/ flexibility in choosing mentorship to work in specialized field in the curriculum as,

- |                                   |                         |
|-----------------------------------|-------------------------|
| I. Capstone Projects              | II. Entrepreneur        |
| III. Research and Higher Studies. | IV. Industry Internship |

### 8. Global Competence:

The curriculum provides a unique opportunity for students to learn and engage in open and effective interaction with people from diverse and interconnected world. The combination of foreign languages (German, Japanese, English) and international internships in the curriculum help the students to build a capacity to examine global and intercultural issues and to propose perspectives and views.

### 9. Industry Induced Internship Program

To support ever demanding industry requirements, the curriculum has included an industry internship with an objective to learn technologies pertaining to their discipline and enhance their technical knowledge with a support of the live platform of Industry.

### 10. Motivation for Self-Learning:

The curriculum also offers a freedom to students to take the initiatives in their learning needs and set the goals with the help of online learning platforms like MOOCs, NPTEL, Swayam, etc.



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**S. Y. B. Tech (Civil Engineering)**

**Academic Year – 2020-2021**

**Semester -III**

| Course Code                | Course                                                                            | Teaching Scheme |     |     | Examination Schemes |          |          |    |     |       | Credits |
|----------------------------|-----------------------------------------------------------------------------------|-----------------|-----|-----|---------------------|----------|----------|----|-----|-------|---------|
|                            |                                                                                   | TH              | Tut | Lab | Theory              |          |          | TW | Lab | Total |         |
|                            |                                                                                   |                 |     |     | ISE (15)            | MSE (25) | ESE (60) |    |     |       |         |
| ES2101                     | Engineering Mathematics-III                                                       | 4               | 1   | 0   | 15                  | 25       | 60       | 25 | -   | 125   | 5       |
| CE2101                     | Solid Mechanics                                                                   | 3               | 0   | 2   | 15                  | 25       | 60       | -  | 50  | 150   | 4       |
| CE2102                     | Building Materials and Construction                                               | 3               | 0   | 0   | 15                  | 25       | 60       | -  | -   | 100   | 3       |
| CE2103                     | Surveying &Geomatics                                                              | 3               | 0   | 4   | 15                  | 25       | 60       | -  | 50  | 150   | 5       |
| CE2104                     | Geotechnical Engg-I                                                               | 3               | 0   | 2   | 15                  | 25       | 60       | -  | 25  | 125   | 4       |
| CE2105A / CE2105B          | Professional Practices in Civil Engineering / Problem Based Experiential Learning | 0               | 0   | 2   | -                   | -        | -        | -  | 25  | 25    | 1       |
| HS2101<br>HS2102<br>HS2103 | Language Proficiency –II<br>English<br>German<br>Japanese                         | 0               | 0   | 2   | -                   | -        | -        | -  | 25  | 25    | 1       |
| **                         | Audit Course-I                                                                    | Non-Credit      |     |     |                     |          |          |    |     |       |         |
| Total                      |                                                                                   | 16              | 01  | 12  | 75                  | 125      | 300      | 25 | 175 | 700   | 23      |

| ** Audit Course Code | Audit Course Title                       |
|----------------------|------------------------------------------|
| HS2106               | Indian Constitution                      |
| CE2106A              | Online Certification                     |
| EC2107               | Intellectual Property Rights and Patents |
| CE2106B              | Road Safety Awareness                    |



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**S. Y. B. Tech (Civil Engineering)**

**Academic Year – 2020-2021**

**Semester –IV**

| Course Code       | Course                                                                            | Teaching Scheme |     |     | Examination Schemes |          |          |    |     |       | Credits |
|-------------------|-----------------------------------------------------------------------------------|-----------------|-----|-----|---------------------|----------|----------|----|-----|-------|---------|
|                   |                                                                                   | TH              | Tut | Lab | Theory              |          |          | TW | Lab | Total |         |
|                   |                                                                                   |                 |     |     | ISE (15)            | MSE (25) | ESE (60) |    |     |       |         |
| CE2107            | Fluid Mechanics                                                                   | 3               | 0   | 2   | 15                  | 25       | 60       | -  | 25  | 125   | 4       |
| CE2108            | Analysis of Structure I                                                           | 3               | 1   | 0   | 15                  | 25       | 60       | 25 | -   | 125   | 4       |
| CE2109            | Engineering Geology                                                               | 3               | 0   | 2   | 15                  | 25       | 60       |    | 25  | 125   | 4       |
| CE2110            | Concrete Technology                                                               | 3               | 0   | 2   | 15                  | 25       | 60       | -  | 25  | 125   | 4       |
| CE2111            | Building Planning and Architecture                                                | 3               | 0   | 2   | 15                  | 25       | 60       | -  | 50  | 150   | 5       |
| CE2112A / CE2112B | Professional Practices in Civil Engineering / Problem Based Experiential Learning | 0               | 0   | 2   | -                   | -        | -        | -  | 25  | 25    | 1       |
| HS2104            | Human Values and Ethics                                                           | 0               | 0   | 2   | -                   | -        | -        | -  | 25  | 25    | 1       |
| **                | Audit Course-II                                                                   | Non Credit      |     |     |                     |          |          |    |     |       |         |
| Total             |                                                                                   | 15              | 01  | 12  | 75                  | 125      | 300      | 25 | 175 | 700   | 23      |

| **Audit Course Code | Audit Course Title                      |
|---------------------|-----------------------------------------|
| EC2114              | Sensor Technology for Civil Engineering |
| CE2113A             | Online Certification                    |
| ME2111-C            | Innovations in Agriculture Engineering  |
| HS2107              | Engineering Economics                   |



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 Department of Civil Engineering



**S. Y. B. Tech (Civil Engineering)**  
**2019 Pattern (SEM-III)**  
**[ES2101] Engineering Mathematics III**

|                                                                                 |                               |                                                                                                                                                                      |
|---------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br><b>TH: - 4 Hours/Week</b><br><b>TU:- 1 Hour/Week</b> | <b>Credit</b><br><b>TH: 5</b> | <b>Examination Scheme:</b><br><b>In Sem. Evaluation: 15 Marks</b><br><b>Mid Sem. Exam: 25 Marks</b><br><b>End Sem. Exam: 60 Marks</b><br><b>Term work : 25 Marks</b> |
|---------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Course Prerequisites:** Differential & Integral Calculous, Taylor series, Differential equations of first order & first degree, Collection, Classification & Representation of data, Fourier series and Vector algebra.

**Course Objective:**

To familiarize the students with concepts and techniques in Ordinary and Partial differential equations, Numerical methods, Statistical methods, Probability theory and Vector Calculus. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

**Course Outcome:**

**After successful completion of the course, students will able to:**

CO1: Solve higher order linear differential equations and its applications to modelling and analyzing civil engineering problems such as bending of beams, whirling of shafts and mass spring systems.

CO2: Solve the system of linear equations using direct & iterative numerical techniques and develop solutions for ordinary differential equations using single step & multistep methods applied to hydraulics, geotechnics and structural systems.

CO3: Apply statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.

CO4: Perform vector differentiation & integration, analyse the vector fields and apply to fluid flow problems.

CO5: Perform vector differentiation & integration, analyse the vector fields and apply to fluid flow problems..

**Course Contents**

| UNIT-I                                                                                                                                                                                                                                                                                                                            | Linear Differential Equations (LDE) and Applications | 9 Hours |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|---------|
| LDE of $n^{\text{th}}$ order with constant coefficients, Complementary Function, Particular Integral, General method, Short methods, Method of variation of parameters, Cauchy's & Legendre's DE, Simultaneous & Symmetric simultaneous DE. Modeling of problems on bending of beams, whirling of shafts and mass spring systems. |                                                      |         |
| UNIT-II                                                                                                                                                                                                                                                                                                                           | Numerical Methods                                    | 9 Hours |



Numerical solutions of system of linear equations: Gauss elimination method, LU decomposition method, Cholesky's method, Jacobi method and Gauss-Seidel method.

Numerical solutions of ordinary differential equations: Euler's method, Modified Euler's method, Runge-Kutta 4<sup>th</sup> order method and Predictor-Corrector methods.

|                                                                                                                                                                                                                                                                                                                                                                           |                                                             |                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------|
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                           | <b>Statistics and Probability</b>                           | <b>9 Hours</b> |
| Measures of central tendency, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression estimates.<br>Probability, Theorems of Probability, Probability density function, Probability distributions: Binomial, Poisson, Normal and Hypergeometric, Test of Hypothesis: Chi-square test, t-test. |                                                             |                |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                            | <b>Vector Differential Calculus</b>                         | <b>9 Hours</b> |
| Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrational and Conservative fields, Scalar potential, Vector identities.                                                                                                                                              |                                                             |                |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                                                             | <b>Vector Integral Calculus and Applications</b>            | <b>9 Hours</b> |
| Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problems in Fluid Mechanics, Continuity equations, Streamlines, Equations of motion, Bernoulli's equation.                                                                                                                                     |                                                             |                |
| <b>UNIT-VI</b>                                                                                                                                                                                                                                                                                                                                                            | <b>Applications of Partial Differential Equations (PDE)</b> | <b>9 Hours</b> |
| Basic concepts, Modeling of vibrating string, Wave equation, one and two dimensional Heat flow equations, method of separation of variables, use of Fourier series. Applications of PDE to problems of civil engineering.                                                                                                                                                 |                                                             |                |

**Text Books:**

T1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).

T2. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).

**Reference Books:**

R1. Advanced Engineering Mathematics, 10e, by Erwin Kreyszig (Wiley India).

R2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).

R3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Cengage Learning).

R4. Numerical Methods for Engineers, 7e by S. C. Chapra and R. P. Canale (McGraw-Hill Education)

R5. Introduction to Probability and Statistics for Engineers and Scientists, 5e, by Sheldon M. Ross (Elsevier Academic Press)

R6. Partial Differential Equations for Scientists and Engineers by S. J. Farlow (Dover Publications, 1993)





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**S. Y. B. Tech (Civil Engineering)**  
**2019 Pattern (SEM-III)**  
**[CE2101] Solid Mechanics**

|                                                                  |                                   |                                                                                                                                             |
|------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>TH: 3 Hours/week<br>LAB: 2 Hours/Week | <b>Credit</b><br>TH:03<br>LAB: 01 | <b>Examination Scheme:</b><br>In Sem. Evaluation:15 Marks<br>Mid Sem. Exam: 25 Marks<br>End Sem. Exam: 60 Marks<br>Lab Evaluation: 50 Marks |
|------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|

**Course Prerequisites:**

Centroid and center of Gravity, Trigonometry and Geometry Basics, Beam Reactions

**Course Objective:**

To develop the ability to understand simple, flexural, shear stresses, bending moment, buckling load and deflection in various structural elements to apply the concepts to engineering problems

**Course Outcome:**

After successful completion of the course, students will able to:

CO1: Determine stress and strain in determinate and indeterminate structures.

CO2: Analyze beams for shear force and bending moment distributions.

CO3: Evaluate the bending stress and shear stress in beams.

CO4: Calculate the torsional and principle stresses and strain in structural members.

CO5: Analyze the axially and eccentrically loaded Columns.

CO6: Calculate the slope and deflection of determinate beams.

Course Contents

| UNIT-I                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Simple Stresses and Strains            | 06 Hours |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----------|
| Concept of stress and strains (Linear, lateral, shear and volumetric), Generalized Hook's law, Stress-Strain curves for brittle and ductile materials.<br>Elastic Constants and their relationships, stresses, strains and deformations in determinate and indeterminate structures for homogeneous and composite structures under concentrated loads, self-weight and temperature changes. 3D stress system, Plane stress system, Plane strain system. |                                        |          |
| UNIT-II                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Shear Force and Bending Moment Diagram | 06 Hours |
| Concept of Shear force and bending moment of different type of loading and beams. Loading diagram from SFD and BMD.                                                                                                                                                                                                                                                                                                                                     |                                        |          |
| UNIT-III                                                                                                                                                                                                                                                                                                                                                                                                                                                | Bending and Shear stresses             | 06 Hours |
| Determination of Moment of Inertia for various cross sections. Stress due to bending: Theory of pure bending, flexure formula, Bending stress distribution diagram, Moment of resistance and section                                                                                                                                                                                                                                                    |                                        |          |

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modulus. Sliced Beams and Composite Beams.

Shear stress in beam: Concept of shear, Shear stress distribution diagram, concept of average shear stress; shear connectors.

**UNIT-IV**

**Torsion and Principal stresses and Strains**

**06 Hours**

Theory of Torsion, Numerical on shaft subjected to twisting moments.

Normal and shear stresses on any oblique planes and concept of principal planes and principal stresses by analytical and graphical method by Mohr's circle. Strain Gauges.

**UNIT-V**

**Axially and eccentrically loaded columns**

**06 Hours**

Concept of critical load and buckling, Euler's formula for column with hinged ends, equivalent length for various end conditions, Rankin's formula, Limitations of Euler's formula, Safe load on column.

Direct and Bending stresses for different structural members (axially and eccentrically loaded). Concept of middle third rule of different sections.

**UNIT-VI**

**Fundamentals of Structure, Slope and Deflection of determinate beams.**

**06 Hours**

Basic concepts of Structural Analysis – Types and Classification of structure based on structural forms.

Concept of indeterminacy and degrees of freedom -Static and Kinematic degree of Indeterminacy.

Slope and deflection of determinate beams by (Macaulay's method/ moment area method / conjugate beam method.)

**Lab Contents**

**Guidelines for Assessment**

Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

**List of Laboratory Assignments/Experiments (minimum 10 to be covered)**

**Group A**

**Bricks and Tiles (Any Three)**

1

Field test, Water absorption and efflorescence test on bricks.

2

Compression strength test on bricks.

3

Abrasion test of flooring tiles.

4

Flexural strength of flooring tiles.

**Group B**

**Metals (Any Five)**

5

Tension test on Mild Steel, Aluminum, copper and TMT steel.

6

Shear (Single and Double) test on mild steel.

7

Torsion Test on mild steel.

8

Impact (I and C) test on mild steel, aluminum, brass.

9

Brinell hardness and Rockwell Hardness test on mild steel.

10

Compression test on Mild Steel/ HYSD bar.

11

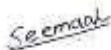
Bend and Re-bend test on Mild Steel and TMT steel.



|                                                                                                                                                                                                                                                                                                                                                   |                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| <b>Group C</b>                                                                                                                                                                                                                                                                                                                                    | <b>Timber and Plywood</b>                                                     |
| <b>13</b>                                                                                                                                                                                                                                                                                                                                         | Compression test on timber (Parallel and Perpendicular to grain)              |
| <b>14</b>                                                                                                                                                                                                                                                                                                                                         | Bending Test on timber and plywood.                                           |
| <b>Group D</b>                                                                                                                                                                                                                                                                                                                                    | <b>Analysis of simple structural elements by using programming languages.</b> |
| <b>Text Books:</b><br>T1 Timoshenko, S. and Yung, D. H., “Strength of Materials”, 3 <sup>rd</sup> ed. East West Press.<br>T2 Dr. R.K.Bansal, “Strength of Materials” 6th ed. Mechanics of solids, Laxmi Publications.                                                                                                                             |                                                                               |
| <b>Reference Books:</b><br>R1. Subramanian, R., “Strength of Materials”, 3rd ed. Oxford Higher Education.<br>R2. Bhavikatti, S. S., “Strength of Material”, 4th ed. Vikas Publication.<br>R3. Gambhir, M. L., “Fundamentals of solid Mechanics”, PHI Learning 2009.<br>R4. Bhavikatti, S. S., “Structural Analysis 1”, 4th ed. Vikas Publication. |                                                                               |
| <b>IS Codes:</b> IS 1608:2005, ISO 6892:1966, IS 432:1966, IS 5242:1969, IS 1717:1985, IS 1757:1973, IS 1708:1980, IS 883:1994, IS 1237:1980, IS 654:1972.                                                                                                                                                                                        |                                                                               |



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**S. Y. B. Tech (Civil Engineering)**  
**2019 Pattern (SEM-III)**  
**[CE2102] Building Materials and Constructions**

|                                              |                        |                                                                                                                |
|----------------------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>TH: - 3Hours/Week | <b>Credit</b><br>TH:03 | <b>Examination Scheme:</b><br>In Sem. Evaluation:15Marks<br>Mid Sem. Exam: 25 Marks<br>End Sem. Exam: 60 Marks |
|----------------------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------|

Course Prerequisites: Building components, Green Building, Sustainable Building Concepts

**Course Objective:**

To make aware about various components of building and their function. The aim is to introduce materials and activities of construction from foundation to finishing of building and also describe importance of the building services, circulation and safety aspects.

**Course Outcome:**

**After successful completion of the course, students will able to:**

- CO1:** Explain details of building components, Masonry and Protective Coating with respect to its functional requirement.
- CO2:** Identify suitability of Form work, underpinning and Scaffolding.
- CO3:** Describe various types of casting methods of concrete, it's curing and prefabrication.
- CO4:** Select suitable types of Roofing and flooring materials and design staircase according to functional requirement of building.
- CO5:** Summarize building services and vertical circulation.
- CO6:** Describe safety aspects to be adopted at construction site.

**Course Contents**

| <b>UNIT-I</b>                                                                                                                                                                                                                                                 | <b>Building Construction and Masonry</b>                        | <b>6 Hours</b> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------|
| Building Components and their basic requirements Principle terms and Types of Stone Masonry, Brick Masonry, Reinforced Brick Masonry and Block Masonry. Protective Coatings (Cladding).                                                                       |                                                                 |                |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                | <b>Partition Wall, Form work, Underpinning and Scaffoldings</b> | <b>6 Hours</b> |
| Types of partition wall (metal, wooden, Gypsum) Slip form work: Component parts- design criteria. Underpinning. Scaffolding: Purpose, types. Nano Materials and Technologies- Carbon nanotubes, silicon Dioxide nanoparticles, Titanium Dioxide nanoparticles |                                                                 |                |
| <b>UNIT-III</b>                                                                                                                                                                                                                                               | <b>Casting Procedure of Concrete and Curing Methods</b>         | <b>6 Hours</b> |

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Form Work and Casting procedure for reinforced concrete RCC columns, beams and slabs. Methods of Curing (Chemical Curing using Admixtures),  
Precast and pre-stressed concrete work, Standardization and Prefabrication to reduce cost.  
Construction Joints in concrete work.

|                |                                          |                |
|----------------|------------------------------------------|----------------|
| <b>UNIT-IV</b> | <b>Building Components and Materials</b> | <b>6 Hours</b> |
|----------------|------------------------------------------|----------------|

Types of Flooring and its functional requirement. Floor materials and finishes. Factory Floor remix, FM floor TR-34, Types of Roof and its functional requirement. Roofing materials.  
Doors, Windows, Arches and Lintels Types of Doors, Windows, Arches and Lintels-Definition, installation, specifications. fixtures and fastenings. Ventilators: Purpose and types.

|               |                                                   |                |
|---------------|---------------------------------------------------|----------------|
| <b>UNIT-V</b> | <b>Building Services and Vertical Circulation</b> | <b>6 Hours</b> |
|---------------|---------------------------------------------------|----------------|

Building services- plumbing services, lighting (Glazing) ventilation, noise and acoustics, communications, smart and intelligent services.  
Vertical Circulations: design consideration, Types of staircase, and details of ramps, Steps, Ladders, lifts, and escalator. Fire escape staircase. Design of Dog-legged staircase.

|                |                                     |                |
|----------------|-------------------------------------|----------------|
| <b>UNIT-VI</b> | <b>Safety on Construction Sites</b> | <b>6 Hours</b> |
|----------------|-------------------------------------|----------------|

Safety on sites, storage of materials, construction safety, fire proof construction. Planning Considerations for Disaster Management.  
Introduction to “Building and Other Construction Workers” Act and IS SP70.

#### **Text Books:**

- T1 B. C. Punmia, Building construction, Laxmi Publications.
- T2 S.V. Deodhar, Building Materials, Khanna Publication.
- T3 Bindra and Arora, Building Construction, Dhanpat Rai Publications
- T4 S.K. Duggal, Building Materials, New Age International Publishers.
- T5 S. C. Rangwala, Building Construction, Charotdar Publications.

#### **Reference Books:**

- R1. Building Services Engineering by David V. Chadderton, (sixth edition or latest edition), London and New York.
- R2. Civil Engineering Materials by Neil Jackson and Ravindra K. Dhir, Palgrave Macmillan. R3. National Building Code -2016 (Latest)
- R4. Building Design and construction by Frederick Merrit, Tata McGraw Hill.
- R5. Times Saver Standards of Architectural Design Data by Callender, Tata McGraw Hill.
- R6. Development plan and DCP Rules of urban local body, Volume 12, New Delhi.
- R7. Model Building bye laws by MoUD, GoI.
- R8. Civil Engineering Materials by TTTI Chandigarh, Tata McGraw Hill Publications
- R9. Materials of construction by D.N. Ghose, Tata McGraw Hill.
- R10. The construction of buildings, Seventh edition, Vol. I and Vol. 2 by R. Barry, Oxford: Blackwell science
- R11. Building Materials Technology by Ruth T. Brantley and L. Reed Brantley, Tata McGraw Hill.
- R12. Properties of Concrete by A.M. Neville, Pearson Education Limited.
- R13. Mitchell’s Advanced Building Construction: The Superstructure by J. Sroud Foster





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**S. Y. B. Tech (Civil Engineering)**  
**2019 Pattern (SEM-III)**  
**[CE2103] Surveying and Geomatics**

|                                                                    |                                  |                                                                                                                                                  |
|--------------------------------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>TH: 03 Hours/Week<br>LAB: 04 Hours/Week | <b>Credit</b><br>TH: 3<br>LAB: 2 | <b>Examination Scheme:</b><br>In Sem. Evaluation : 15 Marks<br>Mid Sem. Exam : 25 Marks<br>End Sem. Exam : 60 Marks<br>Lab Evaluation : 50 Marks |
|--------------------------------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|

**Course Prerequisites : Basic Geometry and Physics, Leveling procedure**

**Course Objective:**

To understand the different kinds of mapping and their relative accuracy along with the different methods of leveling and their accuracy. To use of concepts of geometry in getting solutions to the obstacles in surveying and to set out curves for highways and railways.

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Describe the use of magnetic property of earth to find the directions.

**CO2:** Determine the elevations of objects on earth surface.

**CO3:** Use theodolite observations for mapping.

**CO4:** Apply advanced surveying methods for accurate data collection and mapping.

**CO5:** Set out of curves for highways and railways.

**CO6:** Demonstrate surveying techniques to carry out layout of engineering structures and conduct hydrographic survey .

**Course Contents**

| <b>UNIT-I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Compass and Plane Table Surveying.</b> | <b>6 Hours</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------|
| Definition, objective and fundamental classification of surveying (Plane and Geodetic), concept of Scale, Ranging, Chaining, Offsetting and Traversing. Concept of bearing, meridian and their types, construction and use of prismatic compass, local attraction and correction for local attraction, dip, declination and calculation of true bearings. Equipment required for plane table surveying and their uses, advantages and disadvantages, methods of plane table survey: Radiation, intersection, traversing. |                                           |                |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Levelling and Contouring</b>           | <b>6 Hours</b> |
| Introduction to leveling, Types of leveling, Types of bench marks, Study and use of dumpy level, auto level, digital level and laser level in construction industry, principle axes of dumpy level, testing and permanent adjustments, reciprocal leveling, curvature and refraction corrections, distance to the visible horizon. Contouring – Direct and indirect methods of contouring, uses of contour maps, study and use of topo-sheets, profile leveling and cross-sectioning and their applications.             |                                           |                |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                |                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Theodolite Surveying.</b>                                                                                                                                   | <b>6 Hours</b> |
| Study of vernier transit 20" theodolite, uses of theodolite for measurement of horizontal angles by repetition and reiteration, vertical angles, measurement of deflection angles using transit theodolite and magnetic bearing, prolonging a line, lining in and setting out an angle with a theodolite. Fundamental axes of theodolite: testing and permanent adjustments of a transit theodolite. Theodolite traversing – computation of consecutive and independent co-ordinates, adjustment of closed traverse by transit rule and Bowditch's rule, Gales traverse table. Checks, omitted measurements, area calculation by independent co-ordinates. |                                                                                                                                                                |                |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Tacheometry &amp; Electronic Measurement Techniques</b>                                                                                                     | <b>6 Hours</b> |
| Tacheometry – application and limitations, principle of stadia tacheometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points, finding tacheometric constants. Tacheometric contouring. Surveying using total station – Study and use of Electronic Tacheometer (Total station) types, functions (remote elevation measurements, remote distance measurements, area measurement).                                                                                                                                                                                                                           |                                                                                                                                                                |                |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Curves</b>                                                                                                                                                  | <b>6 Hours</b> |
| Introduction to horizontal and vertical curves (no numerical and derivations to be asked on vertical curves and reverse curves), different types and their applications, simple and compound circular curves, elements and setting out by linear methods such as radial and perpendicular offsets, offsets from long chord, successive bisection of chord and offsets from chords produced. Angular methods: Rankine's method of deflection angles (one and two theodolite methods). (Numerical on simple circular curves and compound curves to be asked), Transition curves: necessity and types                                                         |                                                                                                                                                                |                |
| <b>UNIT-VI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Construction Survey &amp; Hydrographic Surveying</b>                                                                                                        | <b>6 Hours</b> |
| Introduction to construction survey, establishing of horizontal and vertical controls, setting out of buildings, maintaining verticality of tall buildings, survey for open traverse (roadway, railways, drainage lines, water lines, canals). Hydrographic Surveying: Objects, Applications, Establishing controls, Shore line survey, Sounding, Sounding equipment, Methods of locating soundings – conventional and using GPS, Reduction of soundings, Plotting of soundings, Nautical sextant and its use, Three point problem and its use, solution of three point problem by all methods, Tides and tide gauges, determination of MSL                |                                                                                                                                                                |                |
| <b>Lab Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                |                |
| <b>Guidelines for Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                |                |
| Continuous assessment of laboratory work is to be done based on overall performance and lab practicals / assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.                                                                                                                                                                                                        |                                                                                                                                                                |                |
| <b>List of Laboratory Assignments/Experiments (minimum 7 to be covered)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                |                |
| <b>1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Measurement of magnetic bearings of sides of a triangle or polygon, correction for local attraction and calculations of true bearings using prismatic compass. |                |
| <b>2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Finding horizontal and vertical distance using Tacheometer.                                                                                                    |                |
| <b>3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Simple and differential levelling with at least three change points using digital level.                                                                       |                |
| <b>4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Measurement of horizontal angles (by repetition method) using Vernier Transit Theodolite.                                                                      |                |
| <b>5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Setting out a circular curve by Rankine's method of deflection angles.                                                                                         |                |



|                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6                                                                                                                                                                                                                                                        | Setting out a building from a given foundation plan (minimum six co-ordinates).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 7                                                                                                                                                                                                                                                        | Study and use of nautical sextant and measurement of horizontal angles                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 8                                                                                                                                                                                                                                                        | Solution to three point problem by analytical method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 9                                                                                                                                                                                                                                                        | Distance and angle measurements using Total station.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 10                                                                                                                                                                                                                                                       | Measurement and Mapping using Drone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                          | <p><b>Project I:</b> Road project using Auto level for a minimum length of 100 m including fixing of alignment, profile levelling, cross-sectioning, plotting of L section and Cross Section. (One full imperial sheet including plan, L-section and any three typical Cross-sections).</p> <p><b>Project II:</b> Tachometric contouring project on hilly area with at least two instrument stations about 60 m to 100 m apart and generating contours using software such as Autodesk land desktop, Auto-civil, Foresight etc. (minimum contour interval 1 meter).</p> <p><b>Project III:</b> Traversing using a total station (up to 2 acres area)</p> |
| <p><b>Text Books:</b></p> <p>T1. T. P. Kanetkar and Kulkarni, Surveying and Levelling Vol. I and Vol. II, Pune Vidyarthi Griha Prakashan.</p> <p>T2. Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain , Surveying, Vol. I &amp; II, Laxmi Publications.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p><b>Reference Books:</b></p> <p>R1. Surveying by C. Venkatramaiah , University Press.</p> <p>R2. Surveying, Vol. I &amp; II by S. K. Duggal, Tata Mc-Graw Hill.</p> <p>R3. Surveying and Levelling by Subramanian, Oxford University Press.</p>        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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**S. Y. B. Tech (Civil Engineering)**

**2019 Pattern (SEM-III)**

**[CE2104] Geotechnical Engineering- I**

|                                                                     |                                 |                                                                                                                                                 |
|---------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>TH: - 3 Hours/Week<br>LAB: -2 Hours/Week | <b>Credit</b><br>TH:3<br>LAB: 1 | <b>Examination Scheme:</b><br>In Sem. Evaluation: 15 Marks<br>Mid Sem. Exam : 25 Marks<br>End Sem. Exam : 60 Marks<br>Lab Evaluation : 25 Marks |
|---------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|

**Course Prerequisites :Fundamentals of Chemistry, Mathematics, Physics**

**Course Objective:** To provide the basic principles of soil mechanics, Classification systems, Compaction, Permeability, Consolidation and Shear strength characteristics, to understand the engineering behavior of soil to address practical problems in Geotechnical Engineering.

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Explain soil formation, types of soils and methods of soil investigation.

**CO2:** Explain the different soil properties and familiarize laboratory tests used for them.

**CO3:** Identify the various type of soil.

**CO4:** Determine compaction, permeability and Consolidation characteristics of soils.

**CO5:** Calculate shear strength of soil.

**Course Contents**

| UNIT-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Introduction                                      | 06 Hours |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------|
| Introduction: Formation of soils, Phase Diagram, Definitions of Voids ratio, Porosity, Percentage Air voids, Air content, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density and their inter relationships. Problems.<br>SOIL EXPLORATION: Purpose, Planning of subsurface exploration, methods of soil exploration, preliminary study and preparation of Soil investigation report.                                                                                                                             |                                                   |          |
| UNIT-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Index Properties of Soils and their Determination | 06 Hours |
| Index Properties of Soils and Their Determination: Index Properties of soils – Water content, Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, in-situ density. Laboratory methods of determination of index properties of soils: Moisture content, Specific Gravity, Particle size distribution by Sieve analysis and Hydrometer analysis, In-situ density by core cutter & sand replacement methods, Relative Density, Liquid Limit by Casagrande method and Cone penetration method, Plastic limit and shrinkage limit determination. |                                                   |          |
| UNIT-III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Clay Mineralogy & Classification of Soils         | 06 Hours |

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Clay Mineralogy: Single grained, honey-combed, flocculent and dispersed structures, Soil-Water system, Electrical diffuse double layer, adsorbed water, and base-exchange capacity. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite. Expansivity of clay based on Plasticity index, Shrinkage index.

Classification of Soils: Need for soil classification, Requirements for a soil classification system, Particle size classification – MIT classification and IS classification; Textural classification – Unified soil classification and IS classification - Plasticity chart and its importance, Field identification of soils.

|                |                                                     |                 |
|----------------|-----------------------------------------------------|-----------------|
| <b>UNIT-IV</b> | <b>Compaction &amp; Flow of Water through Soils</b> | <b>06 Hours</b> |
|----------------|-----------------------------------------------------|-----------------|

Compaction: Definition, Principle of compaction. Standard and Modified Proctor's tests and their compactive energy. Factors affecting compaction, effect of compaction on soil properties, Field compaction control, Proctor's needle. Field compaction equipment's.

FLOW OF WATER THROUGH SOILS: Darcy's law- assumption and validity, coefficient of permeability

and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation.

|               |                      |                 |
|---------------|----------------------|-----------------|
| <b>UNIT-V</b> | <b>Consolidation</b> | <b>06 Hours</b> |
|---------------|----------------------|-----------------|

Consolidation: Introduction, spring analogy, Terzaghi's consolidation theory, Laboratory consolidation test, Determination of coefficient of consolidation- Square root of time fitting method and logarithm of time fitting method. Time factor. Rate of settlement and its applications in shallow foundation. Introduction of Normal consolidation, over consolidation and Pre consolidation pressure. Introduction, Causes of settlement.

Pressure bulb, Contact pressure, Significant Depth of foundation, Allowable settlement, Differential settlement - I.S. criteria, Types - Elastic settlement, Consolidation settlement.

|                |                                |                 |
|----------------|--------------------------------|-----------------|
| <b>UNIT-VI</b> | <b>Shear Strength of Soils</b> | <b>06 Hours</b> |
|----------------|--------------------------------|-----------------|

Shear Strength of Soils: Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, conventional and modified failure envelopes, Total and effective shear strength parameters, Concept of pore pressure, Sensitivity and Thixotropy of clay. Determination of shear parameters using - Direct shears test, Unconfined compression test and Triaxial compression test; Shear strength tests under different drainage conditions.

#### Lab Contents

#### Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab practicals/assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

#### List of Laboratory Assignments/Experiments (minimum 6 to be covered)

|          |                                                                                                                                         |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> | Specific gravity determination by Pycnometer /density bottle.                                                                           |
| <b>2</b> | Sieve analysis and soil classification as per I.S. Codes,<br>a) Mechanical Analysis using Sieve shaker. b) Study of Hydrometer Analysis |



|   |                                                                                                               |
|---|---------------------------------------------------------------------------------------------------------------|
| 3 | Determination of Consistency limits and their use in soil classification as per I.S. Codes.                   |
| 4 | In situ density/Field Density test by<br>a) Core cutter b) Sand Replacement                                   |
| 5 | Determination of Compaction Characteristics by<br>a) Standard Proctor b) Modified Proctor test                |
| 6 | Determination of coefficient of permeability by<br>a) Constant head method b) Variable head method.           |
| 7 | Shear strength tests on soil<br>a) Direct shear test. b) Unconfined compression test. c) Triaxial Shear test. |

**Text Books:**

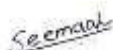
- T1.** Dr. Braja, M. Das (2002), “Principles of Geotechnical Engineering”, Fifth Edition, Thomson Asia Pte Ltd.  
**T2.** Punmia B.C. (2005), “Soil Mechanics and Foundation Engg.” 16th Edition, Laxmi Publications Co., New Delhi.  
**T3.** Dr T G Sitaram and Ramurthy, “Geotechnical Engineering”, S Chand Publications.  
**T4.** Dr. K R Arora “Soil Mechanics and Foundation Engg.”, Standard Publishers.

**Reference Books:**

- R1. Lambe T.W., “Soil Testing for Engineers”, Wiley Eastern Ltd., New Delhi  
R2. C Venkatramaiah, “Geotechnical Engineering”, New Age International Publishers.  
R3. Craig R.F. (2004), “Soil Mechanics”, 7th edition, Spon press, New York.  
R4. Bowles J.E. (1988), “Engineering Properties of Soil and Their Measurements”, McGraw Hill Book Co. New York.



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**S. Y. B. Tech (Civil Engineering)**

**2019 Pattern (SEM-III)**

**[CE2105A] Professional Practices in Civil Engineering**

|                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------|
| <b>Teaching Scheme:</b><br>LAB: - 2 Hours/Week                                                                                                                                                                                                                                                                                                                                                                   | <b>Credit</b><br>LAB: 01          | <b>Examination Scheme:</b><br>TW : 25 Marks |
| <b>Course Prerequisites:</b> Internship related to introduction to Civil Industry at the end of first year.                                                                                                                                                                                                                                                                                                      |                                   |                                             |
| <b>Course Objective:</b> To get acquainted with the standard working practices in construction industry.                                                                                                                                                                                                                                                                                                         |                                   |                                             |
| <b>Course Outcome:</b><br><b>After successful completion of the course, students will able to:</b><br><b>CO1:</b> Describe the roles and responsibilities of various stakeholders in the civil engineering industry.<br><b>CO2:</b> Extract necessary information for construction and project execution.<br><b>CO3:</b> Identify potential hazards and safety practices in civil engineering construction works |                                   |                                             |
| <b>UNIT-I</b>                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Stake Holder</b>               | <b>8 Hours</b>                              |
| 1. Roles of stake Holders-Introduction to construction Industry<br>2. Responsibility of stake holders (Refer PMC/BMC Guideline)<br>3. National Building Code (NBC) Part 1<br>4. Structural Engineering Role& Responsibility.                                                                                                                                                                                     |                                   |                                             |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Civil Engineering Drawings</b> | <b>8 Hours</b>                              |
| 1. Review of symbols, standard practice, IS codes for symbols, scaling detailing & Imagination (Hands- on).<br>2. Introduction & Importance of field sketches<br>3. Know-How of Standard Drawing Practices, IS Codes for symbols etc. Sizes, Folds etc,<br>4. AutoCAD: - paper size, scale, Thickness of line, Font size, etc (Hands-on)<br>5. Shop Drawing, MEP:- Drawing & Detailing (hands-on & Interaction)  |                                   |                                             |
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Safety</b>                     | <b>8 Hours</b>                              |
| 1. Introduction to safety in construction<br>2. Standard Practices and self-training as per NBC part 7<br>3. Quality Control & Monitoring safety practices                                                                                                                                                                                                                                                       |                                   |                                             |
| <b>Lab Contents</b>                                                                                                                                                                                                                                                                                                                                                                                              |                                   |                                             |
| <b>Guidelines for Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                                             |



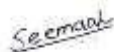
Continuous assessment of laboratory work is to be done based on overall performance and lab practical's /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

**List of Laboratory Assignments/Experiments (minimum 5 to be covered)**

|   |                                                                                                              |
|---|--------------------------------------------------------------------------------------------------------------|
| 1 | Expert lecture by an industry person regarding the introduction of stake holders from construction Industry. |
| 2 | Site visit related to roles and responsibilities of stake holders from the construction industry             |
| 3 | Expert lecture by an industry person for basic concepts and standard practices in civil engineering drawing  |
| 4 | Conduction of Hands on training on Auto-CAD / Micro-Station.                                                 |
| 5 | Execution of practical assignment for a measured drawing with a group of 5 students each.                    |
| 6 | Expert lecture on construction safety practices.                                                             |
| 7 | Site visit to understand the actual execution of safety program on construction site.                        |



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**S. Y. B. Tech (Civil Engineering)**  
**2019 Pattern (SEM-III)**  
**[CE2105B] Problem Based Experiential Learning**

|                                                 |                         |                                                    |
|-------------------------------------------------|-------------------------|----------------------------------------------------|
| <b>Teaching Scheme:</b><br>LAB: - 02 Hours/Week | <b>Credit</b><br>LAB: 1 | <b>Examination Scheme:</b><br>Term work : 25 Marks |
|-------------------------------------------------|-------------------------|----------------------------------------------------|

**Course Prerequisites:** Basics of Physics, Mathematics and basic Civil Engineering.

**Course Objective:**

The primary objective of this project-based learning course is to develop critical thinking and problem-solving skills by exploring and proposing solutions to current engineering and non-engineering problems in real world. This course will help students begin to identify themselves as engineers and prepare them for opportunities for their undergraduate studies. Through working on a team project and reviewing other team projects, students also develop professional skills such as communication (written and oral) and project management. The course is primarily for First year students with an objective of engaging them into the broad spectra of challenges and contemporary issues in real world. Finally, the course will serve as a bridge course between theoretical and practical knowledge

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Identify current social engineering and non-engineering problems.

**CO2:** Suggest methodology or technique to solve the problem after review.

**CO3:** Execute problem solution by collaborating effectively in teams.

**CO4:** Present findings and solutions through well-structured written reports and oral presentations.

**Course Contents**

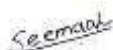
| Sr.No. | Description                                                                | Hours |
|--------|----------------------------------------------------------------------------|-------|
| 1      | Introduction to Project Based Learning                                     | 2     |
| 2      | Challenge your brain                                                       | 2     |
| 3      | Do it yourself!                                                            | 2     |
| 4      | Uniting drawing and technology (Micro Station, Animation with Power point) | 2     |
| 5      | Python for beginner.                                                       | 2     |
| 6      | Problem Identification – I                                                 | 2     |
| 7      | Problem Identification – II                                                | 2     |
| 8      | Project Development – I                                                    | 2     |
| 9      | Project Development – II                                                   | 2     |
| 10     | Project Development – III                                                  | 2     |
| 11     | Project Development – IV                                                   | 2     |



| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Project report submission and Project Demonstration                    | 2                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------|
| <b>Lab Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |                                     |
| <b>Guidelines for Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                        |                                     |
| Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness. |                                                                        |                                     |
| <b>List of Laboratory Assignments/Experiments</b>                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                        |                                     |
| Sr. No.                                                                                                                                                                                                                                                                                                                                                                                                                                            | Idea for The Project                                                   | Subject                             |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Foldable plane table                                                   | Surveying                           |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Laser optical plummet                                                  |                                     |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Understanding the behavior of water and soil                           | Geotechnical Engineering            |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Animation of the building settlement                                   |                                     |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Animation of the shallow and pile foundation                           |                                     |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Soil erosion control in slopes                                         |                                     |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Animation of bridge foundation                                         |                                     |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Study on leaning tower of Pisa as case study                           |                                     |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Animation of a building to understand different components of building | Building Construction and materials |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Animation of brick masonry bonds                                       |                                     |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Damp proof control animation                                           |                                     |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Casting a model of dog-legged stair/types                              |                                     |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Making model a different type of Doors and windows                     |                                     |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Animation of stress and strain development over prismatic member       | Solid Mechanics.                    |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Model of principle stresses                                            |                                     |
| 16                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Animation of torsional concept.                                        |                                     |
| 17                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Types of cracks observed in surrounding structure and investigate it.  |                                     |



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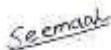
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### Reference Books:

- R1.** Arduino 101 Beginners Guide: How to Get Started with Your Arduino by Erik Savasgard published by Create space IndependentPub.
- R2.** Internet of things hands on approach by ArshdeepBahga, Vijay Madiseti-5 copies published by ArshdeepBagga.
- R3.** Learning Python by Mark Lutz, published by Shroff Publishers & Distributors Pvt Ltd, 5th Edition.
- R4.** Microsoft Office 365 & PowerPoint 2019 Comprehensive by Shelly Cashman Series.
- R5.** [www.bentley.com](http://www.bentley.com)



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**S. Y. B. Tech (Civil Engineering)**  
**2019 Pattern (SEM-III)**  
**[HS2101] Language Proficiency-II (English)**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                  |                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------|
| <b>Teaching Scheme:</b><br>LAB:02 Hours/Week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Credit</b><br>LAB:01                                                          | <b>Examination Scheme:</b><br>Term Work : 25 Marks |
| <b>Course Prerequisites:</b> Basic knowledge of English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                  |                                                    |
| <b>Course Objective:</b> <ul style="list-style-type: none"> <li>• Inculcate the importance of Technical English Communication Skills</li> <li>• Enhance their communicative competence</li> <li>• Enable the students to communicate with clarity and precision</li> <li>• Prepare the students to acquire structure and written expression required for their profession and enable them to acquire proper behavioral skills</li> </ul>                                                                                                                  |                                                                                  |                                                    |
| <b>Course Outcome:</b><br><b>After successful completion of the course, students will able to:</b><br><b>CO1:</b> Employ the understanding of Sentence Correction in day to day life.<br><b>CO2:</b> Understand the importance of grooming properly and imitate it for presentation<br><b>CO3:</b> Express about himself /herself effectively in front of others.<br><b>CO4:</b> Explain their ideas, present PPTs in group meetings/ seminars and take stand for his/her beliefs.<br><b>CO5:</b> Communicate and speak effectively in vocal competitions |                                                                                  |                                                    |
| <b>Course Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |                                                    |
| <b>UNIT-I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Application of Grammar to solve questions and to form sentences correctly</b> | <b>4 Hours</b>                                     |
| Sentence Correction- Subject -Verb agreement, Modifiers, Parallelism, Pronoun-antecedent agreement, Verb time sequence, Prepositions.                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                  |                                                    |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Soft Skills</b>                                                               | <b>4 Hours</b>                                     |
| Corporate Etiquettes, Body Language, Communication (Importance/Skills/Behaviors), Grooming(Dressing/Styling), Proxemics: Space Distance                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                  |                                                    |
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Oral Communication</b>                                                        | <b>4 Hours</b>                                     |
| Speeches for different Occasions, Self-Introduction, Welcome Speech, Introductory Speech, Vote of Thanks Speech                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                  |                                                    |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Presentation</b>                                                              | <b>6 Hours</b>                                     |
| Power point Presentation (Individual/ Group)(On current trends/Travel Destinations/ Upcoming Opportunities etc.)Extempore- Orientation & Mock(Individual Extempore on current affairs/Abstract Topics/ Controversial topics/ Political Views)                                                                                                                                                                                                                                                                                                             |                                                                                  |                                                    |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Placement Essentials</b>                                                      | <b>6 Hours</b>                                     |
| Orientation of Group Discussion, Mock Group Discussion, Interview, Mock Interview, Mock Debate                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                  |                                                    |

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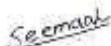
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**Reference Books:**

- R1. K.R.Laxminarayanan, English for Technical Communication, Scitech, Sixth Edition, 2008  
R2. William Sanborn Pfeiffer, T.V.S. Padmaja, Technical Communication: A Practical Approach, Pearson, Sixth Edition 2012  
R3. A.K.Jain, Praveen Bhatia, A.M.Shaikh, Professional Communication Skills, S. Chand and Co: Fifth edition ,2009  
R4. Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hills publishing Company 2006  
R5. F.T.Wood, Remedial English Grammar, Macmillan, 2007  
R6. Andrea J.Rutherford, Phd. Basic Communication Skills for Technology, Pearson Education Asia, 2001  
R7. Exercises in Spoken English, Parts 1 and II CIEFL, Hyderabad, Oxford University Press  
R8. Sanjay Kumar, Pushplata , Communication Skills, Oxford University Press, First edition ,2012



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**S. Y. B. Tech (Civil Engineering)**  
**2019 Pattern (SEM-III)**  
**[HS2102] Language Proficiency-II (German)**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                |                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------|
| <b>Teaching Scheme:</b><br>LAB:- 2Hours/Week                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Credit</b><br>LAB: 1                                                        | <b>Examination Scheme:</b><br>Term Work : 25 Marks |
| <b>Course Prerequisites :</b> Thorough knowledge in English Grammar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                |                                                    |
| <b>Course Objective:</b><br>To build the students' proficiency in German language in reading, speaking, writing and listening as a step towards the A1 Level Goethe Institute Certification.                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                |                                                    |
| <b>Course Outcome:</b><br><b>After successful completion of the course, students will able to:</b><br><b>CO1:</b> develop the skill to introduce themselves and schedule an appointment.<br><b>CO2:</b> understand the Modal verb, vocabulary and rent agreement<br><b>CO3:</b> understand Dativ cases in grammar, set daily time table and activities.<br><b>CO4:</b> summarize past tense and Dativ case pronouns.<br><b>CO5:</b> explain everyday expressions and very simple sentences, which relate to the satisfying of concrete needs.<br><b>CO6:</b> build basic sentence and build a good foundational vocabulary. |                                                                                |                                                    |
| <b>Course Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                |                                                    |
| <b>UNIT-I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Time, Preposition and Articles</b>                                          | <b>5 Hours</b>                                     |
| Grammar Revision: Akkusativ Case– Artikel, Verbs, Prepositions, learn to read and tell time, schedule and reschedule an appointment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                |                                                    |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Modal Verb, Vocabulary House, rooms Furniture</b>                           | <b>5 Hours</b>                                     |
| ModalVerben – when and how to use them and practice, Vocabulary – Houses, Rooms, Furniture, Rent and Agreement.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                |                                                    |
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Past tense, dative cases Vocabulary Time Table and daily Activities</b>     | <b>5 Hours</b>                                     |
| Past tense – Praeteritum of haben and sein; understand the dative case, Speak about the past, Vocabulary, time table and daily activities.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                |                                                    |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Past tense –PII, Dative case Verbs Article and preposition</b>              | <b>5 Hours</b>                                     |
| Vocabulary – Clothes and Fashion, Past tense – Partizip 2, Dativ Case – Pronouns, Verbs, Artikel and Prepositions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                |                                                    |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Personal pronouns of all cases of Vocabulary of Body parts and Vacation</b> | <b>5 Hours</b>                                     |
| Vocabulary – Health and Body Parts, Illnesses and Healthcare system, Vocabulary - Vacation and Holidays; Personal Pronouns – all cases                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                |                                                    |
| <b>UNIT-VI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Evaluation Activity</b>                                                     | <b>3 Hours</b>                                     |

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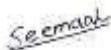
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Text Books:

- T1. Network Deutsch als Fremdsprache A1, Stefanie Dengler
- T2. German Vocabulary for Beginners –Dorota Guzik
- T3. German Language Course, Wiki Books.
- T4. Basic German A Grammar and Workbook, Heiner Schenke and Karen Seago



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**S. Y. B. Tech (Civil Engineering)**  
**2019 Pattern (SEM-III)**  
**[HS2103] Language Proficiency-II (Japanese)**

|                                                                                                                                                                                                                                                                                  |                    |                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------------|
| <b>Teaching Scheme: PR: - 2 Hours/Week</b>                                                                                                                                                                                                                                       | <b>Credit PR:1</b> | <b>Examination Scheme: TW :25 Marks</b> |
| <b>Course Contents</b>                                                                                                                                                                                                                                                           |                    |                                         |
| <b>UNIT-I</b>                                                                                                                                                                                                                                                                    | <b>Hiragana</b>    | <b>02 Hours</b>                         |
| Modified Kana, Contracted sounds, Long vowels, To state the date in Year / Month / Date form.                                                                                                                                                                                    |                    |                                         |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                   | <b>Hiragana</b>    | <b>02 Hours</b>                         |
| Pronunciation of " ん " ( N ), Pronunciation of " つ " ( Tsu ), To state one's Birthday.                                                                                                                                                                                           |                    |                                         |
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                  | <b>Katakana</b>    | <b>02 Hours</b>                         |
| Basic syllabary<br>Asking and stating Telephone numbers.                                                                                                                                                                                                                         |                    |                                         |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                   | <b>Katakana</b>    | <b>04 Hours</b>                         |
| Modified Kana<br>Self-Introduction with Age and Nationality.                                                                                                                                                                                                                     |                    |                                         |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                    | <b>Katakana</b>    | <b>04Hours</b>                          |
| Contracted sounds, Long vowel, Pronunciation of " Tsu " Stating "Time ".                                                                                                                                                                                                         |                    |                                         |
| <b>Guidelines for Assessment</b>                                                                                                                                                                                                                                                 |                    |                                         |
| <ul style="list-style-type: none"> <li>• Total marks assigned are 25.</li> <li>• Continuous assessment will be carried out based on attendance, lab performance, and timely submission of lab file.</li> <li>• Final End semester test examination will be conducted.</li> </ul> |                    |                                         |

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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) Semester -III**  
**[HS2106]: Indian Constitution (Audit Course I)**

**Course Prerequisites:** Nil

**Course Objective:**

To create awareness about Indian Constitution among students

**Course Contents**

**Basic features and fundamental principles:** The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368; however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950.

The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest courts in the world”.

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of

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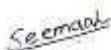
India

9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

**Reference Books: R1. Constitution of India**



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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) Semester -III**  
**[CE2106A]: Online Certification Course (Audit Course I)**

**Course Prerequisites:** Basics analysis or design concepts of the selected course.

**Course Objective:** The objective of this course is, to prepare students to learn the courses using online teaching aids

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Use modern ICT tools for self-learning

**CO2:** Demonstrate the ability of self- learning

**CO3:** Demonstrate the ability to abreast with advance technologies.

**Course Contents**

The students should complete at least one Certification course which will be offered by NPTEL/Spoken tutorial/ Swayam/ IIT Bombay/ MOOC/or any other approved agency by the department during the same semester. The students should select the subjects relevant to Computer Engineering and which should not be included in the specified curriculum. Minimum duration of course should be 4 weeks and all assignments should be submitted. Certification done would be appreciated but not mandatory. In case a student does not go for certification, he/she should pass the internal test organized by department for the said course

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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) Semester –III**  
**[EC2107] Intellectual Property Rights and Patent**  
**(Audit Course- I)**

**Course Prerequisites:** NA

**Course Objectives:**

- To introduce fundamental aspects of Intellectual property Rights (IPR)
- To disseminate knowledge about types of IP like Patents, Copyrights, Trade Secrets
- To make students aware about current trends in IPR and their importance
- To motivate students for innovative thinking and making inventions

**Course Outcomes:**

**After successful completion of the course, students will able to**

CO1: Exhibit the concepts of Intellectual Property Rights

CO2: Differentiate among different IPR

CO3: Formulate and characterize innovative ideas and inventions into IPR

CO4: Demonstrate knowledge of advances in patent law and IP regulations

**Course Contents**

| UNIT-I                                                                                                                                                                                                                                                                   | Overview of Intellectual Property | 02 Hours |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------|
| Introduction and the need for intellectual property right (IPR) - Types of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret. |                                   |          |
| UNIT-II                                                                                                                                                                                                                                                                  | Patents                           | 02 Hours |
| What is invention? Patentability criteria: Novelty, Non-Obviousness (Inventive Steps), Industrial Application, Non- Patentable Subject Matter, Patent Search, Patent Registration Procedure, Rights and Duties of Patentee, Assignment and license, Infringement         |                                   |          |
| UNIT-III                                                                                                                                                                                                                                                                 | Copyrights                        | 02 Hours |
| Concept of Copyright –Copyright Subject matter: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and license of copyright – Infringement  |                                   |          |
| UNIT-IV                                                                                                                                                                                                                                                                  | Trademarks                        | 06 Hours |
| Nature of Trademarks - Different kinds of trademarks (, logos, signatures, symbols, well known marks, brand names, certification and service marks) – Trademarks that can't be registered–                                                                               |                                   |          |



Trademarks

registration procedure - Rights of holder and assignment and licensing of marks - Infringement

**UNIT-V**

**Advances in IP Laws and Government policies**

**06 Hours**

Amendments and India's New National IP Policy, Promoting IPR policy for Start-ups, Career Opportunities in IP - IPR in current scenario

**Reference Books:**

R1. NirajaPandey, Khush deep Dharni (2014), "Intellectual Property Rights", PHI

R2. Nithyananda K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited

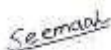
R3. Mishra, "An introduction to Intellectual property Rights", Central Law Publications

R4. Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis

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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) Semester –III**  
**[CE2106B] Road Safety Management (Audit Course- I)**

**Course Pre requisites: Nil**

**Course Objective:**

1. To provide basic overview on road safety & traffic management issues in view of the alarming increase in vehicular population of the country.
2. To explain the engineering & legislative measures for road safety.
3. To discuss measures for improving road safety education levels among the public.

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Summarize the existing road transport scenario of our country.

**CO2:** Explain the method of road accident investigation.

**CO3:** Describe the regulatory provisions needed for road safety.

**CO4:** Identify the safety issues for a road and make use of IRC's road safety manual for conducting road safety audit.

**Course Contents**

| UNIT-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Existing Road Transport Scenario                | 02Hours  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|----------|
| Introduction, national & international statistics related to road transport. Factors responsible for increase in vehicle growth. Share of public transport: importance and current scenario (national & international) Suggestion for effective content delivery: Displaying updated and authentic statistics & real time scenario images during the session.                                                                                                                                                                                                                                            |                                                 |          |
| UNIT-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Road Accidents & its Investigation              | 03 Hours |
| Definition of road accident. National & international statistics related to road accidents. Causes of road accident. Remedies / Measures for control road accidents. Methods for accident investigation. Condition diagram & collision diagram. Black spots & its identification based on accident data.<br>Suggestion for effective content delivery:<br><ol style="list-style-type: none"> <li>1. Activity related to drawing condition &amp; collision diagram based on actual accident data.</li> <li>2. Activity related to identification of black spots based on actual accident data.</li> </ol> |                                                 |          |
| UNIT-III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Motor Vehicle Act & Central Motor Vehicle Rules | 03 Hours |
| The Motor Vehicle Act of 1988. Central Motor Vehicle Rules (CMVR) of 1989. Amendments to CMVR – 2017 & 2019.<br>Suggestion for effective content delivery:<br><ol style="list-style-type: none"> <li>1. Guest lecture by RTO Officer / Traffic Police Officer.</li> <li>2. Public awareness campaign.</li> </ol>                                                                                                                                                                                                                                                                                         |                                                 |          |
| UNIT-IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Road Safety Audit (RSA)                         | 04 Hours |



Introduction & importance of RSA. Methodology, phases and checklists for Road Safety Audit as per IRC SP: 88 – 2010 (Manual on Road Safety Audit)

Suggestion for effective content delivery:

Mini project – Conducting Road Safety Audit on minimum 2 km (both directions included) road stretch in the nearby vicinity.

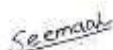
### Lab Contents

#### Guidelines for Assessment

1. Written Test
2. Practical Test
3. Presentation
4. Report



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**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**  
 (An Autonomous Institute Affiliated to SavitribaiPhule Pune University, Pune)



**S. Y. B. Tech (Civil Engineering)**  
**2019 Pattern (SEM-IV)**  
**[CE2107] Fluid Mechanics**

|                                                               |                                   |                                                                                                                                                 |
|---------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b> TH: 3 Hours/Week<br>LAB: 2 Hours/Week | <b>Credit</b><br>TH:03<br>LAB: 01 | <b>Examination Scheme:</b><br>In Sem. Evaluation :15 Marks<br>Mid Sem. Exam : 25 Marks<br>End Sem. Exam : 60 Marks<br>Lab Evaluation : 25 Marks |
|---------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|

**Course Prerequisites:** Engineering Mechanics, Engineering Mathematics and Engineering Physics

**Course Objective:**

To study the fluid properties along with concept of dimensional analysis. Make equipped with principles of continuity, momentum and energy equation applicable to flowing fluid for the civil engineering problems.

**Course Outcome:**

**After successful completion of the course, students will able to:**

- CO1:** Describe fundamental fluid properties
- CO2:** Apply dimensional analysis and similarity principles.
- CO3:** Apply statics concepts to fluid.
- CO4:** Determine fluid kinematics Parameters.
- CO5:** Apply Bernoulli's theorem and flow measurement techniques.
- CO6:** Analyse flow through pipes and turbulence effects.

**Course Contents**

| UNIT-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Properties of Fluid & Dimensional Analysis | 06 Hours |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------|
| Definition of fluid and fluid mechanics: examples and practical applications involving fluids at rest and in motion, physical properties of fluids: density, specific weight, specific volume, relative density and viscosity. Newton's law of viscosity, classification of fluids, rheological diagram, Dynamic and kinematic viscosity, compressibility, cohesion, adhesion, surface tension, capillarity, vapour pressure, problems involving use of above fluid properties.<br>Dimensions of physical quantities, dimensional homogeneity, dimensional analysis using Buckingham's $\pi$ theorem method, geometric kinematic and dynamic similarity, important dimensionless parameters (Reynolds No., Froude No., Euler No., Mach no. and Weber No) and their significance, Model Laws (Froude's Law and Reynold's law), scale effect, distorted & undistorted model. |                                            |          |
| UNIT-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Fluid Statics                              | 06 Hours |

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The basic equation of hydrostatics, concept of pressure head, measurement of pressure (absolute, gauge), application of the basic equation of hydrostatics. Pressure measuring devices (simple manometers, differential manometers: U tube, inclined, Mechanical gauges and precision manometers, pressure transducers and their types).

Centre of pressure, total pressure on plane and curved surfaces, practical applications. Introduction to IS code 3624-1987 (Pressure gauge and vacuum gauge)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                             |                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------|
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Fluid Kinematics</b>                     | <b>06 Hours</b> |
| <p>Methods of describing the motion of fluid, velocity and acceleration, and their components in Cartesian co-ordinates, stream line, stream tube, path line, and streak line, control volume. Classification of flow: steady and unsteady; uniform and non-uniform; laminar and turbulent; One, two, and three-dimensional flows; compressible and incompressible; rotational and irrotational; critical, sub critical and supercritical flows.</p> <p>Equation of continuity for three-dimensional flow in Cartesian co-ordinates, equation of continuity for one-dimensional flow along a streamline, types of motion, rotational and irrotational motion, velocity potential, stream function and flow net, methods of drawing flow net (graphical and electrical analogy), uses and limitations of flow net.</p> |                                             |                 |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Fluid Dynamics, Bernoulli's Equation</b> | <b>06 Hours</b> |
| <p>Forces acting on fluid mass in motion, Euler's equation of motion along a streamline and its integration, assumptions of Bernoulli's equation, Modified Bernoulli's equation, its applications and limitations, Hydraulic grade line and total energy line. Linear momentum equation and kinetic energy correction factor, momentum correction factor (Only information).</p> <p>Discharge measurement by Venturi meter, Orifice and orifice meter, Rotameter, Flow through sharp edged circular orifice discharging free, Hydraulic coefficients for orifice, Pitot tube.</p>                                                                                                                                                                                                                                     |                                             |                 |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Laminar &amp; Turbulent Flow</b>         | <b>06 Hours</b> |
| <p>Reynolds experiment, laminar flow through a circular pipe, flow between two fixed parallel plates: Couette flow (only introduction), methods of measurement of viscosity (Newton's Law of Viscosity: Rotating cylinder viscometer, Stokes' law: Falling sphere viscometer, Hagen Poiseuille Equation: Redwood Viscometer), Darcy's law.</p> <p>Characteristics of flow, instantaneous velocity, temporal mean velocity, scale of turbulence and intensity of turbulence, Prandtl's mixing length theory.</p>                                                                                                                                                                                                                                                                                                       |                                             |                 |
| <b>UNIT-VI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Flow Through Pipes</b>                   | <b>06 Hours</b> |
| <p>Flow through pipes: energy losses in pipe flow (major losses and minor losses), Darcy Weisbach Equation, variation of friction factor for laminar flow and for turbulent flow, Nikuradse's experiments on artificially roughened pipes, resistance to flow in smooth and rough pipes, Friction factor for commercial pipes, Moody's diagram, flow through pipes such as simple, compound, series parallel, Dupuits equations, branched pipes, Three reservoir and pipe network analysis: only theory, flow through siphon.</p>                                                                                                                                                                                                                                                                                     |                                             |                 |
| <b>Lab Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                             |                 |
| <b>Guidelines for Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                             |                 |

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Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab Experiment and assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness

- Both internal and external examiners should jointly frame suitable problem statements for practical examination based on the term work completed.

- During practical assessment, the expert evaluator should give the maximum weightage to the satisfactory implementation of the problem statement.

- The supplementary and relevant questions may be asked at the time of evaluation to test the student for advanced learning, understanding of the fundamentals, effective and efficient implementation.

- Encouraging efforts, transparent evaluation and fair approach of the evaluator will not create any uncertainty or doubt in the minds of the students. So adhering to these principles will consummate our team efforts to the promising boost to the student's academics.

### **List of Laboratory Assignments/Experiments (minimum 8 to be covered)**

#### **Experiments. First six experiments are compulsory.**

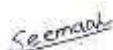
|   |                                                                                                                                      |
|---|--------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Measurement of viscosity by Redwood viscometer.                                                                                      |
| 2 | Measurement of pressures using different pressure measuring devices (including transducers /state of arts digital instruments also). |
| 3 | Experimental verification of Bernoulli's theorem with reference to loss of energy                                                    |
| 4 | Calibration of Venturi meter / Orifice meter.                                                                                        |
| 5 | Drawing flow net by electrical analogy for flow below weir (with & without sheet pile)                                               |
| 6 | Plotting the pattern of laminar flow using Reynolds apparatus or Halshaw's apparatus.                                                |
| 7 | Determination of, minor loss in a pipe system/friction factor for a given pipe.                                                      |

#### **Assignments any two of following**

|   |                                                                                            |
|---|--------------------------------------------------------------------------------------------|
| 1 | Solve three reservoir problem / pipe network analysis using WATER GEMS                     |
| 2 | Determination of friction factor for a pipe using any programming language (PYTHON)        |
| 3 | Application of any fluid mechanics software to analyze the problem.                        |
| 4 | Developing a demo model related to any fluid flow phenomenon (physical model/ soft model). |
| 5 | Assignment on drawing of flow net graphically                                              |

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**Text Books:**

- T1 Hydraulics & Fluid Mechanics by Dr. P. N. Modi and Dr. S. M. Seth, Standard Book House.  
T2 Fluid Mechanics by Dr. A. K. Jain, Khanna Publishers.  
T3. Fluid Mechanics and Fluid Machinery by R. K. Bansal, Laxmi Publications.

**Reference Books:**

- R1. Fluid Mechanics and Hydraulic Machines by McGraw Hill Education (India).  
R2. Fluid Mechanics by Yunus Cengel, Jhon Cimbala, Tata Macgraw Hill, New Delhi.  
R3. Fluid Mechanics by R. J. Garde, A.J Mirajgaonkar, SCITECH Publication.  
R4. Fluid Mechanics by Streeter & Wylie, Tata McGraw Hill.  
R5. Fluid Mechanics by K. Subramanya, McGraw Hill.  
R6. Fluid Mechanics by Frank White, McGraw Hill.

**IS Code:**

- IS code 3624-1987 (Pressure gauge and vacuum gauge)

**Hand books:**

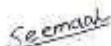
- <http://www.engmatl.com/home/viewdownload/10-engineering-handbooks-pocket-books/123-fluid-mechanics-handbook>
- <http://www.springer.com/materials/mechanics/book/978-3-540-25141-5>.

- **E-Recourses:**

- <http://nptel.iitm.ac.in/courses.php>
- [http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/FLUIDMECHANICS/ui/Course\\_home-3.htm](http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/FLUIDMECHANICS/ui/Course_home-3.htm)



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**S. Y. B. Tech (Civil Engineering)**

**(2019 Pattern) - SEM-IV**

**[CE2108] Analysis of Structure I**

|                                                                    |                                |                                                                                                                                            |
|--------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>TH: 03 Hours/Week<br>TUT: 01 Hours/Week | <b>Credit</b><br>TH:3<br>TU: 1 | <b>Examination Scheme:</b><br>In Sem. Evaluation: 15 Marks<br>Mid Sem. Exam : 25 Marks<br>End Sem. Exam : 60 Marks<br>Term work : 25 Marks |
|--------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|

**Course Prerequisites:** Equilibrium Condition, Bending moment and Shear force diagram, Moment of inertia.

**Course Objective:**

To calculate various unknown forces in determinate and indeterminate structures and to understand the concept of plastic analysis

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Analyse indeterminate beams by using Castigliano's and Clapeyron's theorem

**CO2:** Calculate joint displacement of determinate truss and Solve redundant truss.

**CO3:** Apply influence line diagram of beams and trusses.

**CO4:** Analyze three hinge arches.

**CO5:** Analyze two hinge arches.

**CO6:** Explain the concept of plastic analysis of structures.

**Course Contents**

| UNIT-I                                                                                                                                                                                                                                   | Analysis of Indeterminate Beams                            | 6 Hours |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------|
| Analysis of Propped cantilever and fixed beams by Castigliano's theorem.<br>Analysis of continuous beams by three moment theorem (Clapeyron theorem) up to three indeterminacy, analysis of Indeterminate beams by Castigliano's theorem |                                                            |         |
| UNIT-II                                                                                                                                                                                                                                  | Analysis of Plane Trusses                                  | 6 Hours |
| Determination of joint displacement of determinate trusses using unit load method.<br>Analysis of redundant trusses, lack of fit, sinking of support, temperature changes (indeterminacy up to second degrees).                          |                                                            |         |
| UNIT-III                                                                                                                                                                                                                                 | Influence Line Diagram of Beams and Trusses                | 6 Hours |
| Influence line diagrams for reactions, shear force and bending moment for determinate beams. Influence line diagrams for reactions, shear force and bending moment for indeterminate beams Influence line diagram for trusses.           |                                                            |         |
| UNIT-IV                                                                                                                                                                                                                                  | Influence Line Diagram and Analysis of Three hinged Arches | 6 Hours |



Reactions, shear force and bending moment for rolling load by using Influence line diagrams.  
Three hinged arches – Concepts, types of arches, analysis of parabolic arch with supports at same and different levels, semi-circular arches with support at same level, determination of horizontal thrust, radial shear and normal thrust for parabolic and circular arch.

| UNIT-V                                                                                                                                                                                                                                    | Analysis of Two hinged Arches | 6 Hours |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------|
| Analysis of parabolic and semi-circular arches with supports at same level, determination of horizontal thrust, radial shear and normal thrust,<br>Analysis of parabolic and semicircular arches for temperature effect and rib shorting. |                               |         |

| UNIT-VI                                                                                                                                                                                                                                                                                                                                                                                                                   | Plastic Analysis of Structure | 6 Hours |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------|
| True and idealized stress-strain curve for mild steel in tension, stress distribution in elastic, elasto- plastic and plastic stage, concept of plastic hinge and collapse mechanism, static and kinematic method of analysis, upper, lower bound and uniqueness theorem, concepts and determination of shape factor<br>Plastic moment of resistance and collapse load of determinate and indeterminate beams and frames. |                               |         |

#### Text Books:

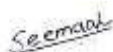
- T1. S. Ramamrutham, S. Narayan “Theory of structures”, Dhanapat Rai Publications.  
T2. S S. Bhavikatti , Structural Analysis Vol-1, third edition, Vikas publishing House, PVT, LTD.

#### Reference Books:

- R1. B C Punmia, Jain, “Mechanics of Materials: Vol I & II”, Laxmi Publications.  
R2. R.C. Hibbeler, “Structural Analysis”, Pearson Education Asia Pub. (5th Edition).  
R3. L. S. Negi and R. S. Jangjid, Structural Analysis, Tata Mc. Graw, New Delhi, 1997.  
R4. Junnarkar S. B., Mechanics of Structure, Volume I and II  
R5. G.S. Pandit and S. P. Gupta, Structural Analysis: A matrix approach, Tata McGraw Hill.



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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) - SEM-IV**  
**[CE2109] Engineering Geology**

|                                                                  |                                  |                                                                                                                                                 |
|------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>TH: 3 Hours/Week<br>LAB: 2 Hours/Week | <b>Credit</b><br>TH: 3<br>LAB: 1 | <b>Examination Scheme:</b><br>In Sem. Evaluation: 15 Marks<br>Mid Sem. Exam : 25 Marks<br>End Sem. Exam : 60 Marks<br>Lab Evaluation : 25 Marks |
|------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|

**Course Prerequisites: Nil**

**Course Objective:** To study basic of engineering geology and introductory part of the earth science to understand the utility and application of geological principles in various phases of civil engineering activities. To explain various natural hazards and their implications on structures and effects on society.

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Explain the basic concepts of engineering geology.

**CO2:** Differentiate between the different rock types, their inherent characteristics and their application in civil engineering.

**CO3:** Describe physical properties, mechanical properties of the minerals and their application in civil engineering.

**CO4:** Identify favourable conditions for the dam, tunnelling and roads through the rock.

**CO5:** Interpret geo-hydrological characters of the rocks present at the foundations of the dams, percolation tanks and tunnels.

**CO6:** Identify geological hazards, presence of groundwater and seismic activities with its effect on the construction

**Course Contents**

| UNIT-I                                                                                                                                                                                                                                                                                                                                           | Introduction             | 6 Hours |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|---------|
| Introduction to Geology: branches of Geology, Scope of Geology in Civil Engineering, internal structure of the Earth, use of seismic waves in analyzing interior of the Earth.<br>Basic processes and features of the earth: Weathering and Erosion. Geological action of rivers, winds, glaciers, and oceans; features created by these agents. |                          |         |
| UNIT-II                                                                                                                                                                                                                                                                                                                                          | Mineralogy and Petrology | 6 Hours |
| Mineralogy: Definition of a mineral, classification of minerals, identification of common minerals in hand specimen.                                                                                                                                                                                                                             |                          |         |



**Petrology:** Introduction, classification of rocks, occurrence and engineering properties of common rock types of India, rock cycle.

**Igneous Petrology:** Formation of igneous rocks from Magma, classification of igneous rocks based on occurrence, mineral composition, color, and Silica percentage. Igneous rock textures.

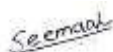
**Sedimentary Petrology:** Formation of sediment, sediment grain size classification, classification of sedimentary rocks based on grain size, classification based on mode of formation (Clastic, Chemical, Residual, and Organic).

**Metamorphic Petrology:** Definition of Metamorphism, process and agents of metamorphism. Types of metamorphism, structures resulting from metamorphic processes. Metamorphic rock textures.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                              |                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------|
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Structural Geology and Stratigraphy</b>                   | <b>6 Hours</b> |
| <p><b>Structural Geology:</b> Parts and types of Folds; Inliers and Outliers, Faults, Joints, Unconformities, structures due to igneous intrusions.</p> <p><b>Plate Tectonics:</b> Theories postulated about formation of folded mountains, Theory of continental drift, Theory of Plate tectonics.</p> <p><b>Stratigraphy:</b> Fundamentals of Stratigraphy, Principles of Stratigraphy, Geological time scale, Physiographic divisions of India, Study of important super groups of Peninsular India.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                              |                |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Surface and Subsurface Investigations, Remote Sensing</b> | <b>6 Hours</b> |
| <p><b>Preliminary Geological Investigation:</b> Methods of surface investigations- Table survey, literature review, reconnaissance survey. Excavations- Trial pit, trenches etc.</p> <p><b>Subsurface Investigations:</b> Seismic refraction survey, Electrical resistivity survey. Core drilling: collection, sampling, and analysis.</p> <p><b>Remote sensing and GIS:</b> Wave and particle nature of light, Electromagnetic spectrum of the Sun, Atmospheric windows and scattering, functioning of a remote sensing system, spectral reflectance curves, application of Remote sensing and GIS in Civil Engineering.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                              |                |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Geological investigations for Dams and Tunnels</b>        | <b>6 Hours</b> |
| <p><b>Geological investigations for Dams and Reservoirs:</b> Strengths, stability, water tightness of the foundation rocks and its physical characters against geological structures at dam sites, favorable and unfavorable geological conditions for locating dam sites. Precautions over unfavorable geological structures like faults, dykes, joints, unfavorable dips on dam sites and their treatments. Tunnel Investigation: Importance of geological considerations while choosing tunnel sites and alignments of the tunnel, safe and unsafe geological and structural conditions, Difficulties during tunneling and methods to overcome the difficulties. Methods of tunneling in soft soil.</p> <p><b>Ground Water Control:</b> Sources, zones, water table, unconfined and Perched water tables. Factors controlling water bearing capacity of rocks, Pervious and Impervious rocks. Cone of depression and its use in Civil engineering. Artesian well (flowing and non-flowing). Springs seepage sites and geological structures. Different types of rocks as source of ground water. Methods of artificial recharge of ground water, geology of percolation tank.</p> |                                                              |                |
| <b>UNIT-VI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Natural Hazards and Their Mitigation</b>                  | <b>6 Hours</b> |



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**a) Landslides:** Types, causes and preventive measures for landslides, Landslides in Deccan region, **Landslide Hazard Zonation, Volcano:** Central type and fissure type, products of volcano and volcanic land forms.

**b) Earthquake:** Earthquake waves, construction and working of seismograph, Earthquake zones of India, elastic rebound theory Preventive measures for structures constructed in Earthquake prone areas.

## Lab Contents

### Guidelines for Assessment

Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

### List of Laboratory Assignments/Experiments (minimum 5 to be covered)

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Study of physical properties of the minerals.                                                                                                                                                                                                                                                                                                                                                                                                                |
| 2 | <b>Identification of minerals:</b> Quartz and its varieties, Orthoclase, Plagioclase, Muscovite, Biotite, Hornblende, Asbestos, Augite, Olivine, Tourmaline, Garnet, Actinolite, Calcite, Dolomite, Gypsum, Beryl, Bauxite, Graphite, Galena, and Pyrite. Hematite, Magnetite, Chromite, Corundum, Talc, Fluorite, Kyanite.                                                                                                                                  |
| 3 | <b>Identification of rocks:</b><br>Igneous rocks: Granite and its varieties, Syenite, Diorite, Gabbro, Pegmatite, Porphyry, Dolerite, Rhyolite, Pumice, Trachyte, Basalt and its varieties, Volcanic, Breccia, Volcanic tuffs.<br>Sedimentary Rock: Conglomerate, Breccia, Sandstone and its varieties, Shale, Limestone, Laterite. Metamorphic Rocks: Mica Schist, Hornblende schist, Slate, Phyllite, Granite Gneiss, Augen gneiss, Marbles and Quartzite. |
| 4 | Study of Geological maps and construction of cross sections, with interpretation (At least 5).                                                                                                                                                                                                                                                                                                                                                               |
| 5 | Study of core samples, RQD, Core logging.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 6 | Measurement of Dip and Strike using clinometers compass.                                                                                                                                                                                                                                                                                                                                                                                                     |
| 7 | Visit to any location of Geological importance, and its report, to be attached in the journal.                                                                                                                                                                                                                                                                                                                                                               |

### Text Books:

- T1 Text book of Engineering Geology: Dr. R. B. Gupte, Pune Vidyarthi Griha Prakashan, Pune.  
T2 Text book of Engineering Geology: P. K. Mukerjee, Asia.  
T3 Text book of Engineering and General Geology: Parbin Singh, Carson Publication.  
T4 Text book of Engineering Geology: N. Chenna, Kesavulu, Mc-Millan.  
T5 Principles of Engineering Geology: K. M. Banger.

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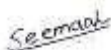
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**Reference Books:**

- R1. Principles of Physical Geology: Arthur Homes, Thomas Nelson Publications, London  
R2. Earth Revealed, Physical Geology: David McGeeary& Charles C. Plummer  
R3. Principles of Geomorphology: William D. Thornbury&John Wiley Publications, New York.  
R4.Geology for Civil Engineering: A. C. McLean, C.D. Gribble, George Allen &UnwinLondon  
R5.Engineering Geology: A Parthasarathy, V. Panchapakesan, R Nagarajan, & Wiley India 2013.



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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) - SEM-IV**  
**[CE2110] Concrete Technology**

|                                                           |                                 |                                                                                                                                                |
|-----------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>TH: - 03/Week<br>LAB: -02/Week | <b>Credit</b><br>TH:3<br>LAB: 1 | <b>Examination Scheme:</b><br>In Sem. Evaluation:15 Marks<br>Mid Sem. Exam : 25 Marks<br>End Sem. Exam : 60 Marks<br>Lab Evaluation : 25 Marks |
|-----------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|

**Course Prerequisites:** Basic civil engineering/ Basics of construction materials like lime, cement, natural & artificial sand, plain cement concrete. Chemistry / chemical reaction between cement & water

**Course Objective:**

The course is designed with the objective to make the students familiarize with physical and mechanical properties of various ingredients of concrete and help them to understand behavioral aspect of concrete in its fresh and hardened state. It helps the students to gain the knowledge of various topics such as deterioration, method of repairs, durability and quality control. It also aims to impart the knowledge regarding concrete mix design and determination of physical properties of ingredients of concrete in laboratory.

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Explain the properties, and significance of ingredient of concrete.

**CO2:** Investigate the properties of fresh concrete.

**CO3:** Investigate the properties of hardened concrete.

**CO4:** Describe the special concrete types and concreting techniques.

**CO5:** Design the concrete mix of desired grade by using various methods.

**CO6:** Explain deteriorations, repairs, durability & Permeability of concrete.

**Course Contents**

| UNIT-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Introduction to Concrete as a Construction Material  | 06 Hours |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------|
| Cement – basic chemistry of cement, Manufacture of Portland cement, hydration of cement, classification of cement, types of cement, and tests on cement<br>Aggregate and water – Different classifications of aggregate, mechanical and physical properties, deleterious materials, soundness, alkali-aggregate reaction, tests on aggregates, artificial and recycled aggregate, tests on water and Admixtures - functions, classification, types: mineral and chemical. |                                                      |          |
| UNIT-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Properties, Production and testing of fresh concrete | 06 Hours |



Fresh concrete: Workability – factors affecting workability, cohesion and segregation, Bleeding, Laitance, manufacturing of concrete, maturity rule.

Tests of fresh concrete – Workability by Slump cone, Compaction factor, Vee Bee consist meter and flow table test, Marsh cone test.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                    |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------------|
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Properties and tests on hardened concrete</b>   | <b>06 Hours</b> |
| <p>Hardened concrete – Strength of concrete, factors affecting strength, relation between tensile and compression strength, impact strength, abrasion resistance, elasticity and creep, shrinkage and swelling. Testing of hardened concrete – Compression test on cube and cylinder, flexural test, indirect tensile strength, core test.</p> <p>Nondestructive testing: Rebound hammer, Ultrasonic pulse velocity, Pullout test and Impact echo test, Rebar locator. Quality control of concrete</p>                                                                                                  |                                                    |                 |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Concreting techniques and Special Concretes</b> | <b>06 Hours</b> |
| <p>Special concreting techniques: pumping of concrete, under water concreting, ready mix concrete, and roller compacted concrete, cold weather concreting, hot weather concreting.</p> <p>Special concretes – Lightweight concrete, polymer concrete, fiber reinforced Concrete, high density concrete, self-compacting concrete, Ferro cement. High performance concrete, Smart concrete, Self-curing concrete and Architectural concrete.</p>                                                                                                                                                         |                                                    |                 |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Concrete Mix Design</b>                         | <b>06 Hours</b> |
| <p>Concepts of Mix Design, Factors to be considered, Statistical quality control, Laboratory trial mixes and guidelines to improve mix, methods of Mix Design for M25 and above grades by IS (10262-2009, 456) and DOE methods Demonstration and application of concrete mix design software. ACI method of mix design.</p>                                                                                                                                                                                                                                                                             |                                                    |                 |
| <b>UNIT-VI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Deterioration and repairs.</b>                  | <b>06 Hours</b> |
| <p>Deterioration – chemical attack and sulphate attack by seawater, acid attack, chloride attack, carbonation of concrete and its determination, corrosion of reinforcement.</p> <p>b) Repairs – Symptoms and diagnosis of distress, evaluation of cracks, selection of repair procedure, repair of defects, common types of repairs, shotcrete, Introduction of retrofitting by using FRP, Corrosion monitoring techniques &amp; preventive measures. Durability and permeability of concrete: strength&amp; durability relationship, volume change in concrete, impact of w/c ratio on durability</p> |                                                    |                 |
| <b>Lab Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                    |                 |
| <b>Guidelines for Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                    |                 |
| <p>Continuous assessment of laboratory work is to be done based on overall performance and lab practical's /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.</p>                                                                                                                                              |                                                    |                 |
| <b>List of Laboratory Assignments/Experiments (minimum 08 to be covered)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                    |                 |
| <b>1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Fineness and standard consistency of cement.       |                 |

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|    |                                                                                                                                     |
|----|-------------------------------------------------------------------------------------------------------------------------------------|
| 2  | Initial and final setting time and soundness of cement.                                                                             |
| 3  | Compressive strength of cement.                                                                                                     |
| 4  | Moisture content, silt content, and Specific gravity of fine aggregate                                                              |
| 5  | Fineness modulus by sieve analysis of fine aggregate.                                                                               |
| 6  | Moisture content, water absorption, and Specific gravity of coarse aggregate                                                        |
| 7  | Density of coarse aggregate and Fine Aggregate                                                                                      |
| 8  | Fineness modulus by sieve analysis and gradation of fine aggregates.                                                                |
| 9  | Workability of concrete by slump test, compaction factor, Vee Bee test, effect of admixture and retarders on setting time concrete. |
| 10 | Compressive strength test of concrete by crushing and Rebound hammer.                                                               |
| 11 | Indirect tensile strength and flexural strength of hardened concrete                                                                |
| 12 | Concrete mix design by IS code method and DOE method. Demonstration and application of concrete mix design software.                |
| 13 | Site visit to RMC plant                                                                                                             |

**Text Books:**

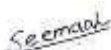
- T1. M. S. Shetty, S Chand, Concrete Technology, New Delhi-110055  
T2. M. L. Gambhir, Concrete Technology, Tata McGraw-Hill.

**Reference Books:**

- R1. A. M. Neville, Properties of concrete, Longman Publishers  
R2. R.S. Varshney, Concrete Technology, Oxford and IBH.  
R3. A. M. Neville, J.J. Brooks, Pearson, Concrete technology  
R4. Dr. D. B. Divekar, Ferrocement Construction Manual, 1030, Shivaji Nagar, Model Colony, Pune.  
R5. A. P. Remideos, Concrete Mix Design, Himalaya Publishing



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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) - SEM-IV**  
**[CE2111] Building Planning and Architecture**

|                                                                       |                                   |                                                                                                                                               |
|-----------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Teaching Scheme:</b><br>TH: - 03 Hours/Week<br>LAB: -04 Hours/Week | <b>Credit</b><br>TH:03<br>LAB: 02 | <b>Examination Scheme:</b><br>In Sem. Evaluation:15 Marks<br>Mid Sem. Exam: 25 Marks<br>End Sem. Exam : 60 Marks<br>Lab Evaluation : 25 Marks |
|-----------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|

**Course Prerequisites:** Principles of planning, fundamentals of Graphics.

**Course Objective:** This course aims to enable students for developing the plan, elevation and section of residential and public building by referring bye-laws and Architectural Aspects along with study of disaster management concepts.

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Describe town planning and its legal aspects.

**CO2:** Explain the building bye laws and guidelines.

**CO3:** Describe green building principles, sustainable materials, and climatic considerations in planning.

**CO4:** Prepare and interpret various types of building drawings by applying IS 962-1989 standards.

**CO5:** Develop Building Plan according to its functional requirements by using various codes.

**CO6:** Develop Public Building Plan and Explain disaster management concept.

**Course Contents**

| UNIT-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Introduction to Planning          | 06 Hours |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------|
| Introduction to Town Planning:<br>Necessity and evolution of town planning in India. Development plan and its importance, Objectives and Contents of DP, Land use zoning, Introduction to different zones of land in town planning, Requirements of various zones, Height zoning and Density zoning. Principles of Architectural design relation between form and function, utility, aesthetics.<br>Legal Aspects:<br>Role of Plan sanctioning authority, 7/12 abstract, meaning of different terms of 7/12 abstract, Form 6 and its types, Concept of TDR, List of documents to be submitted to local authority, Procedure for seeking Commencement and Occupancy Certificate, Various NOCs required |                                   |          |
| UNIT-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Building Bye-Laws and Guide lines | 06 Hours |

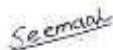


National Building Code-2016, Development Control & Promotion Regulations Rules, Necessity of bye-laws, plot sizes, road width, open spaces, floor area ratio (F.A.R.), concept of V.P.R. Marginal distances, building line: control line, height regulations, room sizes, Area calculations (built-up area, carpet area etc.), Rules for ventilation, lighting, Vertical circulation. Requirements of high-rise buildings. Ownership documents (Agreement for Sale, Sale Deed, Convenience Deed, Lease in case of leasehold properties, Power of Attorney, Agreements Deed/Contracts), stamp duty rates /stamp duty

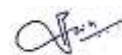
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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------|
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Green Building and Rating System</b>                            | <b>06 Hours</b> |
| <p>Green Building<br/>Introduction to Green Building, Green Materials, Planning concepts (site selection, orientation, sun path and wind diagram etc.), Climatic considerations and Landscaping.<br/>Rating System<br/>Green and Sustainable Building Manuals and Green rating systems (IGBC-Green Building Manuals, GRIHA Green Building Manuals). Green Building Certificates</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                    |                 |
| <b>UNIT-IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Building Drawings</b>                                           | <b>06 Hours</b> |
| <p>Building Drawings Selection scales for various types of drawings, dimensioning, signs, symbols, conventions, and abbreviations as per I.S. 962-1989, Code for Practices for Architectural and Building Drawings.<br/>Types of building drawings-Preliminary Drawings e.g. line plans, sketches ,Sanction Drawings ( Scale recommended 1: 100 or 1:200) e.g. Location Plan, Layout , building plans, sections, elevations, block plan, site plan, location plan, construction notes, Permissible / TDR / utilized floor area and parking provision statement, Working Drawings ( Scale recommended 1: 50 or 1:100) , Stair Case Detailing, Services plan, Section under Ground Water Tank and Over Head Water Tank, Area Statements, Schedule of Opening-Doors, Windows, Ventilators.</p>                                                                                  |                                                                    |                 |
| <b>UNIT-V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Planning of Residential Buildings</b>                           | <b>06 Hours</b> |
| <p>Planning of Residential Buildings:<br/>Functional requirements of Residential buildings and amenities. Planning and design for Preliminary Drawings, Sanctioning drawings:<br/>Working Drawings for residential buildings-Bungalows, row houses, twin bungalows, Ownership Flats, Apartments, Complexes, detached buildings, Semi-detached building.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                    |                 |
| <b>UNIT-VI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Planning of Public Buildings and Disaster Management System</b> | <b>06 Hours</b> |
| <p>Planning of Public Buildings City Development Plan - Identification of Land use and permissibility, Planning of public buildings- Functional requirements and planning of all types of public buildings (Line Plan only)- Business building, Mercantile building, Industrial buildings, Commercial buildings, Educational buildings, Institutional buildings, Assembly buildings, Storage Building, Hazardous buildings, unsafe building, high rise building, Low-Rise Building, office building, Special Building, Whole Sale Establishment buildings, Vegetable Markets, Parking Lots.<br/>Disaster Management System- Disaster Management Cycle. Safety on sites, Fire safety-Fire load, grading of occupancies by fire loads, Evacuation Time, Fire Escape Elements, and need for Flood Protection &amp; Earthquake Resistant Structures, Planning Considerations</p> |                                                                    |                 |



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## Lab Contents

### Guidelines for Assessment

Innovative Concept, Line work, planning/designing abilities, presentations and understanding based on oral examination of relevant exercises.

List of Laboratory Assignments/Experiments (minimum 04 to be covered)

- |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Students shall prepare working drawings of any type of Residential or Public building on A1 paper with suitable scale.<br>Layout/site plan indicating water supply and drainage line (with area statement).<br>Floor Plan/Typical floor plan, Parking plan, Foundation Plan/ Centre Line Plan, Terrace plan, Electric Layout Plan, Plumbing Plan/Sanitation Plan, Site Plan, Location Plan, Structural Drawings, (with construction notes, schedule of openings) |
| 2 | Working drawings of any type of Residential or Public building drafted using software (Bentley-Micro Station, Auto-CAD, CADD, RIVET, Google Sketch etc.) or any type of software to the suitable scale or preferably 1:50.                                                                                                                                                                                                                                       |
| 3 | Elevation and Sectional Elevation (preferably to be drawn on same sheet).                                                                                                                                                                                                                                                                                                                                                                                        |
| 4 | Perspective drawing of a small building element from the same project.                                                                                                                                                                                                                                                                                                                                                                                           |
| 5 | Prepare a report file (It shall consist of data/information of the project, planning considerations and line plans, Design calculations).                                                                                                                                                                                                                                                                                                                        |

#### Text Books:

- T1.** M. G. Shah, C.M. Kale and S. Y. Patki, building drawings with an integrated Approach to Build-Environment, Tata McGraw Hill, New Delhi (5<sup>th</sup> Edition or Latest edition)  
**T2.** Dr. S.V. Deodhar, Building Science and planning, Khanna Publishers.  
**T3.** David V. Chadderton, Building Services Engineering (sixth edition or latest edition), London and New York.  
**T4.** Jan A. Van Der Westhuizen, Drawing for Civil Engineering.

#### Reference Books:

- R1.** National Building Code -2016 (Latest)  
**R2.** Building Design and construction by Frederick Merrit, Tata McGraw Hill.  
**R3.** Times Saver Standards of Architectural Design Data by Callender, Tata McGraw Hill.  
**R4.** I.S. 962-1989 Code for practice for Architectural and Building Drawings.  
**R5.** Development plan and DCP Rules of urban local body, Volume 12, New Delhi.  
**R6.** Model Building bye laws by MoUD, GoI.  
**R7.** Green and Sustainable Building Manuals by IGBC-Hyderabad and TERI-GRIHA, New Delhi.  
**R8.** Building Materials by S.K. Duggal, New Age International Publishers.  
**R9.** Civil Engineering Materials by TTTI Chandigarh, Tata McGraw Hill Publications

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**S. Y. B. Tech (Civil Engineering)**

**(2019 Pattern) - SEM-IV**

**[CE2112A] Professional Practices in Civil Engineering**

|                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                          |                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--------------------------|---------------------------------------------------------|
| <b>Teaching Scheme:</b><br>LAB: - 2 Hours/Week                                                                                                                                                                                                                                                                                                                                                                   |                                   | <b>Credit</b><br>LAB: 01 | <b>Examination Scheme:</b><br>Lab Evaluation : 25 Marks |
| <b>Course Prerequisites:</b> Internship related to introduction to Civil Industry at the end of first year.                                                                                                                                                                                                                                                                                                      |                                   |                          |                                                         |
| <b>Course Objective:</b> To get acquainted with the standard working practices in construction industry.                                                                                                                                                                                                                                                                                                         |                                   |                          |                                                         |
| <b>Course Outcome:</b><br><b>After successful completion of the course, students will able to:</b><br><b>CO1:</b> Describe the roles and responsibilities of various stakeholders in the civil engineering industry.<br><b>CO2:</b> Extract necessary information for construction and project execution.<br><b>CO3:</b> Identify potential hazards and safety practices in civil engineering construction works |                                   |                          |                                                         |
| <b>UNIT-I</b>                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Stake Holder</b>               |                          | <b>8 Hours</b>                                          |
| 1. Roles of stake Holders-Introduction to construction Industry<br>2. Responsibility of stake holders (Refer PMC/BMC Guideline)<br>3. National Building Code (NBC) Part 1<br>4. Structural Engineering Role& Responsibility.                                                                                                                                                                                     |                                   |                          |                                                         |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Civil Engineering Drawings</b> |                          | <b>8 Hours</b>                                          |
| 1. Review of symbols, standard practice, IS codes for symbols, scaling detailing & Imagination (Hands-on).<br>2. Introduction & Importance of field sketches<br>3. Know-How of Standard Drawing Practices, IS Codes for symbols etc. Sizes, Folds etc,<br>4. AutoCAD: - paper size, scale, Thickness of line, Font size, etc (Hands-on)<br>5. Shop Drawing, MEP:- Drawing & Detailing (hands-on & Interaction)   |                                   |                          |                                                         |
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Safety</b>                     |                          | <b>8 Hours</b>                                          |
| 1. Introduction to safety in construction<br>2. Standard Practices and self-training as per NBC part 7<br>3. Quality Control & Monitoring safety practices                                                                                                                                                                                                                                                       |                                   |                          |                                                         |
| <b>Lab Contents</b>                                                                                                                                                                                                                                                                                                                                                                                              |                                   |                          |                                                         |
| <b>Guidelines for Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                 |                                   |                          |                                                         |



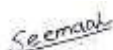
Continuous assessment of laboratory work is to be done based on overall performance and lab practical's /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

**List of Laboratory Assignments/Experiments (minimum 5 to be covered)**

|   |                                                                                                              |
|---|--------------------------------------------------------------------------------------------------------------|
| 1 | Expert lecture by an industry person regarding the introduction of stake holders from construction Industry. |
| 2 | Site visit related to roles and responsibilities of stake holders from the construction industry             |
| 3 | Expert lecture by an industry person for basic concepts and standard practices in civil engineering drawing  |
| 4 | Conduction of Hands on training on Auto-CAD / Micro-Station.                                                 |
| 5 | Execution of practical assignment for a measured drawing with a group of 5 students each.                    |
| 6 | Expert lecture on construction safety practices.                                                             |
| 7 | Site visit to understand the actual execution of safety program on construction site.                        |



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**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**  
 (An Autonomous Institute Affiliated to SavitribaiPhule Pune University, Pune)



**S. Y. B. Tech (Civil Engineering)**

**(2019 Pattern) - SEM-IV**

**[CE2112B] Problem Based Experiential Learning**

|                                                 |                         |                                                         |
|-------------------------------------------------|-------------------------|---------------------------------------------------------|
| <b>Teaching Scheme:</b><br>LAB: - 02 Hours/Week | <b>Credit</b><br>LAB: 1 | <b>Examination Scheme:</b><br>Lab Evaluation : 25 Marks |
|-------------------------------------------------|-------------------------|---------------------------------------------------------|

**Course Prerequisites:** Basics of Physics, Mathematics and basic Civil Engineering.

**Course Objective:**

The primary objective of this project-based learning course is to develop critical thinking and problem-solving skills by exploring and proposing solutions to current engineering and non-engineering problems in real world. This course will help students begin to identify themselves as engineers and prepare them for opportunities for their undergraduate studies. Through working on a team project and reviewing other team projects, students also develop professional skills such as communication (written and oral) and project management. The course is primarily for First year students with an objective of engaging them into the broad spectra of challenges and contemporary issues in real world. Finally, the course will serve as a bridge course between theoretical and practical knowledge

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1:** Identify current social engineering and non-engineering problems.

**CO2:** Suggest methodology or technique to solve the problem after review.

**CO3:** Execute problem solution by collaborating effectively in teams.

**CO4:** Present findings and solutions through well-structured written reports and oral presentations.

**Course Contents**

| Sr.No. | Description                                                                | Hours |
|--------|----------------------------------------------------------------------------|-------|
| 1      | Introduction to Project Based Learning                                     | 2     |
| 2      | Challenge your brain                                                       | 2     |
| 3      | Do it yourself!                                                            | 2     |
| 4      | Uniting drawing and technology (Micro Station, Animation with Power point) | 2     |
| 5      | Python for beginner.                                                       | 2     |
| 6      | Problem Identification – I                                                 | 2     |
| 7      | Problem Identification – II                                                | 2     |
| 8      | Project Development – I                                                    | 2     |
| 9      | Project Development – II                                                   | 2     |
| 10     | Project Development – III                                                  | 2     |
| 11     | Project Development – IV                                                   | 2     |

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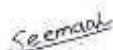
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| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Project report submission and Project Demonstration                    | 2                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------|
| <b>Lab Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                        |                                     |
| <b>Guidelines for Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                        |                                     |
| Continuous assessment of laboratory work is to be done based on overall performance and lab practicals /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness. |                                                                        |                                     |
| <b>List of Laboratory Assignments/Experiments</b>                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                        |                                     |
| Sr. No.                                                                                                                                                                                                                                                                                                                                                                                                                                            | Idea for The Project                                                   | Subject                             |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Foldable plane table                                                   | Surveying                           |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Laser optical plummet                                                  |                                     |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Understanding the behavior of water and soil                           | Geotechnical Engineering            |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Animation of the building settlement                                   |                                     |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Animation of the shallow and pile foundation                           |                                     |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Soil erosion control in slopes                                         |                                     |
| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Animation of bridge foundation                                         |                                     |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Study on leaning tower of Pisa as case study                           |                                     |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Animation of a building to understand different components of building | Building Construction and materials |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Animation of brick masonry bonds                                       |                                     |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Damp proof control animation                                           |                                     |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Casting a model of dog-legged stair/types                              |                                     |
| 13                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Making model a different type of Doors and windows                     |                                     |
| 14                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Animation of stress and strain development over prismatic member       | Solid Mechanics.                    |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Model of principle stresses                                            |                                     |
| 16                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Animation of torsional concept.                                        |                                     |
| 17                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Types of cracks observed in surrounding structure and investigate it.  |                                     |



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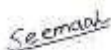
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### Reference Books:

- R1.** Arduino 101 Beginners Guide: How to Get Started with Your Arduino by Erik Savasgard published by Create space IndependentPub.
- R2.** Internet of things hands on approach by ArshdeepBahga, Vijay Madiseti-5 copies published by ArshdeepBagga.
- R3.** Learning Python by Mark Lutz, published by Shroff Publishers & Distributors Pvt Ltd, 5th Edition.
- R4.** Microsoft Office 365 & PowerPoint 2019 Comprehensive by Shelly Cashman Series.
- R5.** [www.bentley.com](http://www.bentley.com)



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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) - SEM-IV**  
**[HS2104] Human Values and Ethics**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                     |                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------|
| <b>Teaching Scheme:</b><br>LAB: -2 Hours/Week                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Credit</b><br>LAB: 01                            | <b>Examination Scheme:</b><br>Term work : 25 Marks |
| <b>Course Prerequisites : Nil</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                     |                                                    |
| <b>Course Objective:</b><br>To imbibe basic knowledge of ethical decision making when confronted with problems in the working environment and aware about Ethics and Human Values.                                                                                                                                                                                                                                                                                                       |                                                     |                                                    |
| <b>Course Outcome:</b><br>After successful completion of the course, students will able to:<br><b>CO1:</b> Relate foundational concepts of value education, self-exploration, happiness, prosperity, and the basic human aspirations.<br><b>CO2:</b> Sensitize towards gender equality, confidence building and stress management.<br><b>CO3:</b> Develop natural acceptance of human values, competence in professional ethics.                                                         |                                                     |                                                    |
| <b>Course Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                     |                                                    |
| <b>UNIT-I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Concept of Human Values</b>                      | <b>8 Hours</b>                                     |
| Definition, Concept of Human Values, Need, Content, Process and relevance to present day. Aim of education and value education, Evolution of value-oriented education. types of values, Components of value education. Understanding oneself and others, Johari Window- Concept, explanation, implementation; Goal achievement through SWOT Analysis and Time management matrix: Personal values and ethics – Types of values and their importance of values from students' perspective. |                                                     |                                                    |
| <b>UNIT-II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Value Education towards Personal Development</b> | <b>8 Hours</b>                                     |
| Self-analysis and introspection; sensitization towards gender equality, physically challenged, intellectually challenged. Respect to - age, experience, maturity, family members, neighbors, co-workers. Morals, values and Ethics, Integrity, Work ethic, Civic virtue, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, stress management                                                                                                                              |                                                     |                                                    |
| <b>UNIT-III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Ethics</b>                                       | <b>8 Hours</b>                                     |
| What is Ethics, Definition of Ethics, importance of integrity Engineering Ethics: Purpose of engineering Ethics, Professional and professionalism, Professional roles to be played by engineers, Influence of ethics in family life.                                                                                                                                                                                                                                                     |                                                     |                                                    |
| <b>Lab Contents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                     |                                                    |
| <b>Guidelines for Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                     |                                                    |
| Continuous assessment of laboratory work is to be done based on overall performance and lab practical's /assignments performance of student. Each lab practical/assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.                                      |                                                     |                                                    |
| <b>List of Laboratory Assignments/Experiments (minimum 5 to be covered)</b>                                                                                                                                                                                                                                                                                                                                                                                                              |                                                     |                                                    |



- **Assignment/ Seminar based on above syllabus.**

Reference Books:

R1: William K. Frankena , “ Ethics” , Second Edition, Pearson India Education Services Pvt.Ltd.

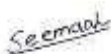
R2: Caroline Whitbeck, “Ethics in Engineering Practice and Research, Second Edition, Cambridge University Press.

R3: Charles E Harris, Micheal J Rabins, —Engineering Ethics, Fourth Edition Cengagen Learningl, ISBN-13:978- 1133934684.

R4: A Alavudeen“ Professional Ethics And Human Values” Firewall, ISBN13 : 8131803066.



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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) - SEM-IV**  
**Audit Course - II**

The purpose of audit courses is to give general awareness about the social issues to the students. Students are expected to apply the scientific way to analyze the data and make use of their technical expertise to deal with the issues. The basic objective is to give a different learning experience in context with social issues. Assessment of the student's work will be done on the basis of assignments/reports/presentations/oral/exam/test.

**Criteria:**

The student registered for audit course shall be awarded the grade AP (Audit Course Pass) and shall be included such AP grade in the Semester grade report for that course, provided student has at least 75% or above attendance and satisfactory in-semester performance and secured a passing grade in that audit course. No grade points are associated with this 'AP' grade and performance in these courses is not accounted in the calculation of the performance indices SGPA and CGPA

**Evaluation Criteria:**

**Guidelines for Conduction (Any one or more of following but not limited to)**

- |                                                                                                                                               |                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Lectures/ Guest Lectures</li> <li>Visits (Social/Field) and reports</li> <li>Demonstrations</li> </ul> | <ul style="list-style-type: none"> <li>Surveys</li> <li>Mini Project</li> <li>Hands on experience on</li> </ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|

**Guidelines for Assessment (Any one or more of following but not limited to)**

- |                                                                                                                                     |                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Written Test</li> <li>Demonstrations/ Practical Test</li> <li>Poster presentation</li> </ul> | <ul style="list-style-type: none"> <li>Presentations</li> <li>IPR/Publication</li> <li>Report</li> </ul> |
|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|

**Audit Course II**

| **Audit Course Code | Audit Course Title                      |
|---------------------|-----------------------------------------|
| EC2114              | Sensor Technology for Civil Engineering |
| CE2113A             | Online Certification                    |
| ME2111-C            | Innovations in Agriculture Engineering  |
| HS2107              | Engineering Economics                   |

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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) - SEM-IV**  
**[EC2114]: Sensor Technologies for Civil Engineering**  
**Audit Course - II**

**Course Prerequisites:** Applications of temperature, pressure, electrical, velocity, acceleration and vibration systems in Civil Engineering

**Course Objective:**

*"Providing principle knowledge, practical training and measurement best practice for a range of temperature, pressure, electrical, velocity, acceleration and vibration systems"*

The objective of this Course is to understand instrumentation, sensor theory and technology, data acquisition, digital signal processing, damage detection algorithm, life time analysis and decision making. This course introduces theoretical and practical principles of design of sensor systems. Topics include: transducer characteristics for acoustic, current, temperature, pressure, electric, magnetic, gravity, salinity, concentration of contaminants, velocity, heat flow, and optical devices; limitations on these devices imposed by building/structure/pavement environments; signal conditioning and recording; noise, sensitivity, and sampling limitations; and standards. Lectures will cover the principles of state-of-the-art systems being used in physical infrastructure/bridges/buildings/pavements, etc. For lab work, the course will allow students to prepare, deploy and analyze observations from standard instruments.

**Course Outcome:**

After successful completion of the course, students will able to:

- CO1. Analyze the errors during measurements
- CO2. Specify the requirements in the calibration of sensors and instruments
- CO3. Describe the noise added during measurements and transmission
- CO4. Describe the measurement of electrical variables
- CO5. Describe the requirements during the transmission of measured signals
- CO6. Construct Instrumentation/Computer Networks
- CO7. Suggest proper sensor technologies for specific applications
- CO8. Design and set up measurement systems and do the studies

**Course Contents**

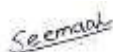
| UNIT-I                                                                                                                                                                                                                                                                                                                                                      | Fundamentals of Measurement, Sensing and Instrumentation | 4 Hours |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------|
| Definition of measurement and instrumentation, physical variables, common types of sensors; Describe the function of these sensors; Use appropriate terminology to discuss sensor applications; and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics, Permanent installations, Temporary installations. |                                                          |         |



| UNIT-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Sensor Installation and Operation               | 4 Hours |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|---------|
| Predict the response of sensors to various inputs, Construct a conceptual instrumentation and monitoring program. Describe the order and methodology for sensor installation. Differentiate between types of sensors and their modes of operation and measurement and Approach to Planning Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation & Configuration, Advanced topic, Sensor design, Measurement uncertainty                                                                                                                                                                                                                                             |                                                 |         |
| UNIT-III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Data Analysis and Interpretation                | 4 Hours |
| Fundamental statistical concepts, b) Data reduction and interpretation, c) Piezometer, Inclinator, Strain gauge, etc. d) Time domain signal processing, e) Discrete signals, Signals and noise and f) a few examples of statistical information to calculate are: Average value (mean), On average, how much each measurement deviates from the mean (standard deviation), Midpoint between the lowest and highest value of the set (median), Most frequently occurring value (mode), Span of values over which your data set occurs (range)                                                                                                                                                            |                                                 |         |
| UNIT-IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Frequency Domain Signal Processing and Analysis | 4 Hours |
| Explain the need for frequency domain analysis and its principles; Draw conclusions about physical processes based on analysis of sensor data; Combine signals in a meaningful way to gain deeper insight into physical phenomena, Basic concepts in frequency domain signal processing and analysis, Fourier Transform, FFT (Fast Fourier Transform), Example problems: Noise reduction with filters, Leakage, Frequency resolution                                                                                                                                                                                                                                                                    |                                                 |         |
| <b>Text Books:</b><br>T1. W. Bolton; “Mechatronics, Electronic Control Systems in Mechanical and Electrical Engineering”; Pearson Education; 4th Edition<br>T2. Curtis Johnson; “Process Control Instrumentation Technology”; Prentice Hall of India Pvt. Ltd.; 8th Edition<br>T3. David G. Alciatore, Michael B Hstand; “Introduction to Mechatronics and Measurement System”; Tata McGraw Hill 3rd Edition<br>T4. Madhuchhanda Mitra, Samarjit Sen Gupta; “Programmable Logic Controllers and Industrial Automation, An Introduction”; Penram International Publishing India (Pvt) Ltd<br>T5. Liptak; “Handbook of Process control”<br>T6. H. S. Kalsi; “Electronic Instrumentation” Tata McGraw Hill |                                                 |         |
| <b>Reference Books:</b><br><b>R1. Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann</b><br><b>R2. David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press</b><br><b>R3. S. Tumanski (2006), Principle of Electrical Measurement, Taylor &amp; Francis</b><br><b>R4. IlyaGertsbakh (2010), Measurement Theory for Engineers, Springer</b>                                                                                                                                                                                                                                                                                     |                                                 |         |



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**JSPM's**  
**RAJARSHI SHAHU COLLEGE OF ENGINEERING**  
**TATHAWADE, PUNE-33**  
(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)



**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) - SEM-IV**  
**[CE2113A]: Online Certification Course**  
**Audit Course - II**

**Course Prerequisites:** Basics analysis or design concepts of the selected course.

**Course Objective:** The objective of this course is, to prepare students to learn the courses using online teaching aids

**Course Outcome:**

**After successful completion of the course, students will able to:**

**CO1: Use modern ICT tools for self-learning**

**CO2: Demonstrate the ability of self- learning**

**CO3: Demonstrate the ability to abreast with advance technologies.**

**Course Contents**

The students should complete at least one Certification course which will be offered by NPTEL/Spoken tutorial/ Swayam/ IIT Bombay/ MOOC/or any other approved agency by the department during the same semester. The students should select the subjects relevant to Computer Engineering and which should not be included in the specified curriculum. Minimum duration of course should be 4 weeks and all assignments should be submitted. Certification done would be appreciated but not mandatory. In case a student does not go for certification, he/she should pass the internal test organized by department for the said course

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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) - SEM-IV**  
**[ME2111-C]: Innovations in Agriculture Engineering**  
**Audit Course - II**

**Course Prerequisites:** Knowledge of Mathematics, Physics, and Chemistry is necessary, Out of box/unconventional thinking for solving typical problems, Adapting analytical tools traditionally, Application oriented thinking of learnt topics.

**Course Objective:**

To develop holistically built thinking habit needed for innovative ideas.  
 To aware about key field of agriculture contributing to sustenance and development of a mankind.  
 To expose students' roles and responsibilities of building a nation through engineering insights in agriculture.  
 To update with innovations and technological advancements in respective fields of engineering.

**Course Outcome:**

After successful completion of the course, students will able to:  
 CO1: Discuss what is thinking, its tools and process and its application to innovation  
 CO2: Explain and develop application of innovation in engineering  
 CO3: Use important terms like national productivity, sustainable development and inclusive growth  
 CO4: Demonstrate the various technologies in agriculture  
 CO5: Apply Interdisciplinary Engineering applications in Agriculture

**Course Contents**

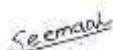
| Unit -I   | Thinking and thinking process                                                                                                                                                                                                                                                                                                                                                              |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Thinking and thinking tools: Thinking, Types of thinking, Top-Down (Analysis) & Bottom-Up (Synthesis) thinking and combination of, Judgment and Creativity, Concept Maps Connecting the ideas, Generating ideas. Communicating ideas. Systems thinking and beyond. Critical thinking. Definition of innovation. Example of application of thinking process to any one practical innovation |
| Unit -II  | Engineering Innovation and its scope                                                                                                                                                                                                                                                                                                                                                       |
|           | Incremental, radical and disruptive Innovation. Scope of innovation: Product innovation, Process innovation, Position innovation, Paradigm innovation. Innovation within the engineering profession. Awareness about latest technological advancements.                                                                                                                                    |
| Unit -III | Agriculture and innovation                                                                                                                                                                                                                                                                                                                                                                 |
|           | Definition of agriculture, Role of Agriculture in our life and in national productivity. Concept of sustainable development and inclusive growth. India's urban awakening. Innovation in agriculture and its types. Importance of agriculture innovation.                                                                                                                                  |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>Unit -IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Developing technologies in agriculture</b>       |
| Favorable conditions for Agriculture innovation. Dynamics of Innovation System. Role and responsibility of Engineers in agricultural innovations and making India the net exporter of major agricultural produces. FIN Ovation Awards. Ideas on developing technologies in agriculture viz. Vehicle automation, Engine emissions technology, Fire suppression technology etc. The future of robotics on farms.                                                                      |                                                     |
| <b>Unit -V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Interdisciplinary Engineering in Agriculture</b> |
| Technological innovations that are revolutionizing Indian agriculture. Case study presenting Interdisciplinary Engineering application in Agriculture.                                                                                                                                                                                                                                                                                                                              |                                                     |
| <b>Guidelines for Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                     |
| The assessment of the course will be done at the institute level. During the course students will be submitting the assignments. A copy of the same can be submitted as a part of term work for the corresponding Audit course. On the satisfactory submission of assignments, the student should be marked as “Present” and the student will be awarded the grade P on the mark-sheet                                                                                              |                                                     |
| <b>Text Books:</b><br>T1. Kasser, J., E., 2015. Holistic Thinking: Creating Innovative Solutions to Complex Problems: Volume 1 (Solution Engineering). Create Space Independent Publishing Platform; 2 editions.<br>T2. Wenwu Zhang, 2011. Intelligent Energy Field Manufacturing: Interdisciplinary Process Innovations. CRC Press, Taylor & Francis Group.<br>T3. Educating engineers to drive the innovation economy, 2012. Publisher: The Royal Academy of Engineering, London. |                                                     |
| <b>Reference Books:</b><br>R1. Crowder, J., A., Carbone, J., N., Demijohn, R., 2016. Multidisciplinary Systems Engineering: Architecting the Design Process. Springer Publishing.<br>R2. India’s urban awakening: Building inclusive cities, sustaining economic growth, 2010. Mckinsey Global Institute report.                                                                                                                                                                    |                                                     |



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**S. Y. B. Tech (Civil Engineering)**  
**(2019 Pattern) - SEM-IV**  
**[HS2107]: Engineering Economics**  
**Audit Course - II**

**Course Objective:**

To introduce the essentials of economics. Also, to increase economic knowledge and how the markets work and understand the basics of market competition. To understand how International Markets, work and their principles and to understand how start-ups to be initiated.

**Course Outcome:**

**After successful completion of the course, students will able to:**

- CO1: Explain the nature of markets and competition
- CO2: Discuss the Basic Concepts of Economics, Micro and Macro
- CO3: Enumerate the importance of how industries behave
- CO4: Justify the basis in our day to day life to gain personal financial control
- CO5: List the steps to begin start-up culture and economics
- CO6: Discuss the finance generation and funding rounds

**Course Contents**

| UNIT-I                                                                                                                                                                                                                                                                                                                                                | Basic Concepts of Economics          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Introduction, Definitions, Overview of Micro and Macro Economics, Explanation of theories of demand, supply and market equilibrium and Economics Basics – Cost, efficiency and scarcity, Opportunity Cost                                                                                                                                             |                                      |
| UNIT-II                                                                                                                                                                                                                                                                                                                                               | Micro Economics                      |
| Differences and Comparison, Theories of Utility and Consumers Choice, Competition and Market Structures, Markets and Prices, Market Failures, Income Distribution and Role of Government                                                                                                                                                              |                                      |
| UNIT-III                                                                                                                                                                                                                                                                                                                                              | Macro Economics                      |
| Aggregate Demand and Supply, Economic Growth and Business Cycles, The role of the Nation in economic activity, New Economic Policy in India, Fiscal Policy, GDP and Inflation, Consumption, savings and investments, Commercial and Central banking                                                                                                   |                                      |
| UNIT-IV                                                                                                                                                                                                                                                                                                                                               | Introduction to Industrial Economics |
| Behaviour of firms: Strategies with regard to entry, pricing, advertising, and R & D and innovation. The development of Firms and Market and Industrial Structure: Stochastic models of firm growth, and market structure, inter-industry differences in growth rate variance, economies of scale, technical change mergers and market concentration. |                                      |
| UNIT-V                                                                                                                                                                                                                                                                                                                                                | Role of Industrial Economics         |
| Development of Competitive capabilities: Role of Technology and Skills, FDI and Technology Transfer, Technological Spillovers, Globalization and Technology Intermediation.                                                                                                                                                                           |                                      |
| Guidelines for Assessment                                                                                                                                                                                                                                                                                                                             |                                      |



The assessment of the course will be done at the institute level. During the course students will be submitting the assignments. A copy of the same can be submitted as a part of term work for the corresponding Audit course. On the satisfactory submission of assignments, the student should be marked as “Present” and the student will be awarded the grade P on the mark-sheet.

**Text Books:**

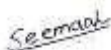
- T1. Baumol, William J., Economic Theory and Operations Analysis, [Prentice Hall India Ltd.] Fourth Edition  
T2. Sloman, John H., Economics [Prentice Hall India Ltd.] Second Edition, 1994.  
T3. Varian, Hal, ` Intermediate Microeconomics: A Modern Approach, Fifth Edition [Norton, 1999].  
T4. P.A. Samuelson & W.D. Nordhaus, Economics, McGraw Hill, New York, 1995.  
T5. Koutsoyiannis, Modern Microeconomics, Macmillan, 1975.  
T6. R. Pindyck and D.L. Rubinfeld, Microeconomics, Macmillan Publishing Company, New York, 1989.

**Reference Books:**

- R1. R.J. Gordon, Macroeconomics 4th Edition, Little Brown & Co., Boston, 1987.  
R2. William F. Shughart II, the Organization of Industry, Richard D. Irwin, Illinois, 1990.



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