

People's Education Society's (Mumbai)  
**P. E. S. COLLEGE OF ENGINEERING**  
(An Autonomous Institute)

Nagsen Vana, Chhatrapati Sambhajnagar, Maharashtra, 431002

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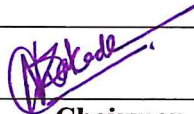
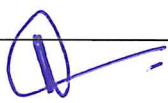
Web: [www.pescoe.ac.in](http://www.pescoe.ac.in)



**CURRICULUM FOR UNDERGRADUATE PROGRAMME**  
**B.Tech. Second Year**  
**Department of Civil Engineering**

**In line with National Education Policy 2020 Guidelines**

**[With Effect from the Academic Year 2026-2027]**

|                                                                                     |                                                                                     |                                                                                     |                 |         |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------|---------|
|  |  |  | 13/06/2026      | 1.00    |
| Chairman<br>Board of Studies                                                        | Dean<br>Academics                                                                   | Chairman Academic<br>Council                                                        | Date of Release | Version |

### INSTITUTE VISION

- To create sound technical manpower with global competitiveness, morality, and social sense.

### INSTITUTE MISSION

- To provide the state-of-art technical infrastructure and motivate students to realize their own potential.
- To provide an embellished academic and congenial environment to students for complete learning experience.
- To promote intellectual, moral, and social democracy to ensure all round development of the students.

### DEPARTMENT VISION

- To create sound technical manpower with global competitiveness, morality, and social sense

### DEPARTMENT MISSION

- To provide state-of-the-art technical infrastructure and motivate students to realize their own potential.
- To provide an enriched academic and congenial environment to students for a complete learning experience.
- To promote intellectual, moral, and social values to ensure the all-round development of students.

### Grading and Evaluation Process:

i. Based on the Examinations and Evaluation, students will be awarded letter grades after combining the performance of all Evaluations for the respective course.

These letter grades will be derived from quantitative and qualitative Evaluation converted into 10-point scale called as grade point for credit courses. The performance with grade points and equivalent letter grades for Absolute grading for admitted batches will be as mentioned in the following table:

| Percentage of Marks | Letter Grade | Grade Points |
|---------------------|--------------|--------------|
| 91-100              | EX           | 10.0         |
| 86-90               | AA           | 9.0          |
| 81-85               | AB           | 8.5          |
| 76-80               | BB           | 8.0          |
| 71-75               | BC           | 7.5          |
| 66-70               | CC           | 7.0          |
| 61-65               | CD           | 6.5          |
| 56-60               | DD           | 6.0          |
| 51-55               | DE           | 5.5          |
| 40-50               | EE           | 5.0          |
| 0-39                | FF           | 00           |

  
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Dated :-..... 13/06/2026

ii. Class is awarded based on CGPA of all eight semester of B.Tech program.

| CGPA for pass is minimum 5.0        |              |
|-------------------------------------|--------------|
| CGPA up to < 5.50                   | Pass Class   |
| CGPA $\geq$ 5.50 & < 6.00           | Second Class |
| CGPA $\geq$ 6.00 & < 7.50           | First Class  |
| CGPA > 7.50                         | Distinction  |
| [Percentage of Marks = CGPA * 10.0] |              |

iii. Apart from credit courses, Non-credit courses will be awarded with letter grades based on quantitative and qualitative Evaluations at PP (Pass) and NF (Not Passed).

**Pasting Criteria:** Student should score minimum 20 out of 60 in End Semester Examination.

**Passing Percentage: 40 out of 100**

\*Minimum 50% of total credits should be there to promote the student in the next higher class.

\*National / State level sports / cultural events / NSS / NCC / Yoga etc. certificates shall be considered at department level by HOD or Subject teacher for attendance and internal assessment.

\*If the student is passed in all subjects of First year, then only that student can take admission in the Third year and if the student is passed in all subjects of Second year then only that student can take admission in the Fourth/Final year.

#### **Gracing Rule:**

Three marks grace to maximum three subjects (total 09 marks), for every year subject to change in the result of the student (e.g. fail to pass). These 09 marks shall be distributed in three subjects as per requirement to change the results from fail to pass.

If student fails in more than three subjects, no grace will be given. Students those who have not availed any grace marks for any subject during the entire course then 1% grace marks (final year aggregate marks) shall be awarded to improve his/her class.

#### **Calculation of SGPA and CGPA:**

##### **a. Semester Grade Point Average (SGPA):**

The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPA is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:



$$SGPA = \frac{[\sum_{i=1}^n c_i g_i]}{[\sum_{i=1}^n c_i]}$$

Where

'n' is the number of subjects for the semester,

'c<sub>i</sub>' is the number of credits allotted to a particular subject, and

'g<sub>i</sub>' is the grade-points awarded to the student for the subject based on his performance as per the above table.

SGPA will be rounded off to the second place of decimal and recorded as such.

#### **b. Cumulative Grade Point Average (CGPA):**

An up-to-date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since he/she entered the Institute. CGPA is also calculated at the end of every semester (up to two decimal places). Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^m c_i g_i]}{[\sum_{i=1}^m c_i]}$$

Where,

'm' is the total number of subjects from the first semester onwards up to and including the semesters,

"c<sub>i</sub>" is the number of credits allotted to a particular subject, and

'g<sub>i</sub>' is the grade-points awarded to the student for the subject based on his/her performance as per the above table.

CGPA will be rounded off to the second place of decimal and recorded as such.

It is to be noted that the CGPA Is not the average of SGPA.

CGPA to equivalent Percentage Conversion

CGPA shall be calculated with the following formula

**Percentage (%) = (CGPA \* 10.0)**

#### **Semester-wise Total Credit Summary**

| Semester                          | Total Credits |
|-----------------------------------|---------------|
| Semester I & II (F.Y. B.Tech.)    | 44            |
| Semester III                      | 22            |
| Semester IV                       | 22            |
| Semester V                        | 22            |
| Semester VI                       | 22            |
| Semester VII                      | 22            |
| Semester VIII                     | 22            |
| <b>Grand Total (Sem I → VIII)</b> | <b>176</b>    |

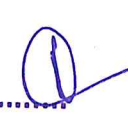


**Illustrative Semester wise Credit distribution structure for Four Year UG Engineering Program -  
One Major, One Minor**

| Semester                                           |                                                         | I            | II           | III          | IV           | V            | VI           | VII          | VIII         | Total Credits  |
|----------------------------------------------------|---------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------|
| Basic Science Course                               | BSC/ESC                                                 | 06-08        | 08-10        |              | --           | --           | --           | --           | --           | 14-18          |
| Engineering Science Course                         |                                                         | 10-08        | 06-04        |              | --           | --           | --           | --           | --           | 16-12          |
| Programme Core Course (PCC)                        | Program Courses                                         | --           | 02           | 08-10        | 08-10        | 10-12        | 08-10        | 04-06        | 04-06        | 44-56          |
| Programme Elective Course (PEC)                    |                                                         | --           | --           | --           | --           | 04           | 08           | 02           | 06           | 20             |
| Multidisciplinary Minor (MD M)                     | Multidisciplinary Courses                               |              | -            | 02           | 02           | 04           | 02           | 02           | 02           | 14             |
| Open Elective (OE) Other than a particular program |                                                         | --           | --           | 04           | 02           | 02           | --           | --           | --           | 08             |
| Vocational and Skill Enhancement Course (VSEC)     | Skill Courses                                           | 02           | 02           | --           | 02           | --           | 02           | --           | --           | 08             |
| Ability Enhancement Course (AEC -01, AEC-02)       | Humanities Social Science and Management Courses (HSSM) | 02           | --           | --           | 02           | --           | --           | --           | --           | 04             |
| Entrepreneurship/Economics/ Management Courses     |                                                         | --           |              | 02           | 02           | --           | --           | --           | --           | 04             |
| Indian Knowledge System (IKS)                      |                                                         |              | 02           |              | --           | --           | --           | --           | --           | 02             |
| Value Education Course (VEC)                       |                                                         | --           | --           | 02           | 02           | --           | --           | --           | --           | 04             |
| Research Methodology                               | Experiential Learning Courses                           | --           | --           | --           | --           | --           | --           |              | 04           | 04             |
| Comm. Engg. Project (CEP)/Field Project (FP)       |                                                         | --           | --           | 02           | --           | --           | --           | -            | -            | 02             |
| Project                                            |                                                         | --           | --           | --           | --           | --           | --           |              | 04           | 04             |
| Internship/ OJT                                    |                                                         | --           | --           |              |              | --           | --           | 12           | -            | 12             |
| Co-curricular Courses (CC)                         | Liberal Learning Courses                                | 02           | 02           |              | --           | --           | --           | --           | -            | 04             |
| <b>Total Credits (Major)</b>                       |                                                         | <b>20-22</b> | <b>20-22</b> | <b>20-22</b> | <b>20-22</b> | <b>20-22</b> | <b>20-22</b> | <b>20-22</b> | <b>20-22</b> | <b>160-176</b> |

**Abbreviations:** Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Indian Knowledge System: IKS; Value Education Courses: VEC; OJT: On Job Training; Internship/ Apprenticeship; Field projects: FP; Community engagement project: CEP; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP, Liberal Learning Course: Lib. Learn, Courses on Humanities, Social Science, and Management: HSSM

**Note:** The Credit Distribution Table given above is illustrative only. The Universities/ Autonomous Colleges may suitably modify within the broader framework of credit distribution across seven verticals and as per the AICTE rules and regulation.

  
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### Teaching & Evaluation Scheme for Second Year B.Tech. Civil Engineering

#### Semester III

| Course Category | Course Code | Course Title                        | Teaching Scheme |   |   | Evaluation Scheme |     |     |            | Credits   |
|-----------------|-------------|-------------------------------------|-----------------|---|---|-------------------|-----|-----|------------|-----------|
|                 |             |                                     | L               | T | P | CA                | MSE | ESE | Total      |           |
| PCC             | BTPESCE301T | Mechanics of Solids                 | 3               | - | - | 20                | 20  | 60  | 100        | 3         |
| PCC             | BTPESCE302T | Fluid Mechanics-I                   | 3               | - | - | 20                | 20  | 60  | 100        | 3         |
| PCC             | BTPESCE303T | Surveying                           | 3               | - | - | 20                | 20  | 60  | 100        | 3         |
| PCC             | BTPESCE301L | Mechanics of Solids Lab.            | -               | - | 2 | 20                | -   | 30* | 50         | 1         |
| PCC             | BTPESCE302L | Fluid Mechanics-I Lab.              | -               | - | 2 | 20                | -   | 30* | 50         | 1         |
| MDM             | BTPESMXXXX  | <b>Multidisciplinary Minor -I</b>   | 2               | - | - | 10                | 10  | 30  | 50         | 2         |
| OE              | BTPESOE30T  | Applied Mathematics                 | 4               | - | - | 20                | 20  | 60  | 100        | 4         |
|                 | BTPESOE2T   | Business Communication              |                 |   |   |                   |     |     |            |           |
|                 | BTPESOE13T  | Employability and Skill Development |                 |   |   |                   |     |     |            |           |
| HSSM            | BTPESCE306T | Economics for Engineers             | 1               | - | - | 50                | -   | -   | 50         | 1         |
| VEC             | BTPESUHVT   | Universal Human Values              | 3               | - | - | 20                | 20  | 60  | 100        | 3         |
| FP              | BTPESCE303L | Surveying / Field Project           | -               | - | 2 | 50                | -   | 50* | 100        | 1         |
| <b>Total</b>    |             |                                     |                 |   |   |                   |     |     | <b>800</b> | <b>22</b> |

#### Semester IV

| Course Category | Course Code | Course Title                                | Teaching Scheme |   |   | Evaluation Scheme |     |     |            | Credits   |
|-----------------|-------------|---------------------------------------------|-----------------|---|---|-------------------|-----|-----|------------|-----------|
|                 |             |                                             | L               | T | P | CA                | MSE | ESE | Total      |           |
| PCC             | BTPESCE401T | Building Construction & Planning            | 3               | - | - | 20                | 20  | 60  | 100        | 3         |
| PCC             | BTPESCE402T | Theory of Structure-I                       | 3               | - | - | 20                | 20  | 60  | 100        | 3         |
| PCC             | BTPESCE403T | Fluid Mechanics -II                         | 3               | - | - | 20                | 20  | 60  | 100        | 3         |
| PCC             | BTPESCE404T | Concrete Technology                         | 3               | - | - | 20                | 20  | 60  | 100        | 3         |
| PCC             | BTPESCE401L | Building Construction and Planning Lab      | -               | - | 2 | 20                | -   | 30* | 50         | 1         |
| PCC             | BTPESCE403L | Fluid Mechanics Lab - II                    | -               | - | 2 | 20                | -   | 30* | 50         | 1         |
| PCC             | BTPESCE404L | Material Testing Lab - I                    | -               | - | 2 | 20                | -   | 30* | 50         | 1         |
| MDM             | BTPESMXXXX  | <b>Multidisciplinary Minor -II</b>          | 2               | - | - | 10                | 10  | 30  | 50         | 2         |
| OE              | BTPESOE31T  | Introduction to MATLAB                      | 2               | - | - | 10                | 10  | 30  | 50         | 2         |
|                 | BTPESOE23T  | Smart Cities & Urban Technologies           |                 |   |   |                   |     |     |            |           |
|                 | BTPESOE24T  | GIS & Mapping for Beginners                 |                 |   |   |                   |     |     |            |           |
| VSEC            | BTPESCE406T | Software Application in Civil Engineering-I | -               | - | 2 | 50                | -   | 50* | 100        | 2         |
| HSSM - VEC      | BTPESCOIT   | Constitution of India                       | 1               | - | - | 20                | -   | 30* | 50         | 1         |
| <b>Total</b>    |             |                                             |                 |   |   |                   |     |     | <b>800</b> | <b>22</b> |

\* Practical/ Oral evaluation at the end of semester; Abbreviations:- L: Lecture; T: Tutorial; P: Practical; CA: Continuous Assessment; MSE: Mid-Semester Assessment; ESE: End-Semester Assessment.

Page 6 of 50

  
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**Dated :-...13/06/2026.....**



### Multidisciplinary Minor Subjects Bucket

| Multidisciplinary Minor Subjects               |                                                             |                 |   |   |                   |     |     |       |         |
|------------------------------------------------|-------------------------------------------------------------|-----------------|---|---|-------------------|-----|-----|-------|---------|
| Course Code                                    | Course Title                                                | Teaching Scheme |   |   | Evaluation Scheme |     |     |       | Credits |
|                                                |                                                             | L               | T | P | CA                | MSE | ESE | Total |         |
| Multidisciplinary Minor – I for Semester III   |                                                             |                 |   |   |                   |     |     |       |         |
| BTPESM01T                                      | Engineering Geology & Soil Mechanics                        | 2               | - | - | 10                | 10  | 30  | 50    | 2       |
| Multidisciplinary Minor – II for Semester IV   |                                                             |                 |   |   |                   |     |     |       |         |
| BTPESM02T                                      | Building Construction & Planning                            | 2               | - | - | 10                | 10  | 30  | 50    | 2       |
| Multidisciplinary Minor – III for Semester V   |                                                             |                 |   |   |                   |     |     |       |         |
| BTPESM02T                                      | Transportation Engineering (Highway, Tunnel, Bridges)       | 3               | 1 | - | 20                | 20  | 60  | 100   | 4       |
| Multidisciplinary Minor – IV for Semester VI   |                                                             |                 |   |   |                   |     |     |       |         |
| BTPESM03T                                      | Estimation and Costing (Building, Road, Water supply, etc.) | 2               | - | - | 10                | 10  | 30  | 50    | 2       |
| Multidisciplinary Minor – V for Semester VII   |                                                             |                 |   |   |                   |     |     |       |         |
| BTPESM04T                                      | Urban Water Supply & Sewerage System                        | 2               | - | - | 10                | 10  | 30  | 50    | 2       |
| Multidisciplinary Minor – VI for Semester VIII |                                                             |                 |   |   |                   |     |     |       |         |
| BTPESM05T                                      | Airport, Port & Railway Infrastructure                      | 2               | - | - | 10                | 10  | 30  | 50    | 2       |

### Open Elective Subjects

| Course Code                      | Course Title                        | Teaching Scheme |   |   | Evaluation Scheme |     |     |       | Credits |  |
|----------------------------------|-------------------------------------|-----------------|---|---|-------------------|-----|-----|-------|---------|--|
|                                  |                                     | L               | T | P | CA                | MSE | ESE | Total |         |  |
| Open Elective-I for Semester III |                                     |                 |   |   |                   |     |     |       |         |  |
| BTPESOE30T                       | Applied Mathematics                 | 3               | 1 | - | 20                | 20  | 60  | 100   | 4       |  |
| BTPESOE2T                        | Business Communication              | 3               | 1 | - | 20                | 20  | 60  | 100   | 4       |  |
| BTPESOE13T                       | Employability and Skill Development | 3               | 1 | - | 20                | 20  | 60  | 100   | 4       |  |
| Open Elective-II for Semester IV |                                     |                 |   |   |                   |     |     |       |         |  |
| BTPESOE31T                       | Introduction to MATLAB              | 2               | - | - | 10                | 10  | 30  | 50    | 2       |  |
| BTPESOE23T                       | Smart Cities & Urba Technologies    | 2               | - | - | 10                | 10  | 30  | 50    | 2       |  |
| BTPESOE24T                       | GIS & Mapping for Beginners         | 2               | - | - | 10                | 10  | 30  | 50    | 2       |  |

  
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|                    |                            |            |                 |                  |
|--------------------|----------------------------|------------|-----------------|------------------|
| <b>BTPESCE301T</b> | <b>Mechanics of Solids</b> | <b>PCC</b> | <b>3L-0T-0P</b> | <b>3 Credits</b> |
|--------------------|----------------------------|------------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To understand the fundamental concepts of stress, strain, elastic behavior, and mechanical properties of construction materials under different loading conditions.  |
| 2.                       | To develop the ability to analyze determinate and indeterminate structural members subjected to axial loads, temperature changes, shear forces, and bending moments. |
| 3.                       | To study the distribution of shear and bending stresses in beams and apply flexural and shear stress theories for structural analysis and design.                    |
| 4.                       | To understand the behavior of circular shafts under torsion and to analyze principal stresses and strains in structural elements subjected to combined loading.      |
| 5.                       | To evaluate the stability and strength of axially and eccentrically loaded columns and structural components using Euler's, Rankine's, and stress analysis concepts. |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                             | <b>Bloom's Taxonomy Level</b> |
|------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Explain the concepts of stress, strain, elastic constants, temperature stresses, and mechanical behavior of engineering materials. | K2                            |
| 2          | Analyze determinate and indeterminate members and draw shear force and bending moment diagrams for various loading conditions.     | K4                            |
| 3          | Apply the theories of shear stress and bending stress to determine stress distribution and moment carrying capacity of beams.      | K3                            |
| 4          | Evaluate torsional behavior of circular shafts and determine principal stresses and strains under combined stress conditions.      | K5                            |
| 5          | Analyze the stability and stress behavior of axially and eccentrically loaded columns and determine safe load carrying capacity.   | K4                            |

| <b>Module</b>    | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Hrs</b> |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>  | <b>Simple Stresses and Strains:</b><br>a) Materials used in construction and their nature, Hook's Law, Stress-Strain Diagram for elastic, plastic materials and brittle material, Idealized stress-strain diagram, Concept of axial stresses (compression, tension), strains (linear, lateral, shear and volumetric), Elastic constants and their relations. Stresses and strains due to change in temperature.<br>b) Stresses, strains and deformations in determinate and indeterminate structures for homogeneous and composite structures under concentrated loads and temperature changes. | 10         |
| <b>Module II</b> | <b>Shear Force and Bending Moment Diagram.</b><br>Concept of shear force and bending moment. Relation between shear force, bending moment and intensity of loading. Shear force and bending moment diagrams for determinate beams due to concentrated, uniformly distributed, uniformly varying loads and couples. Bending moment and loading diagram from given shear force diagram.                                                                                                                                                                                                           | 10         |

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|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |    |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Module III</b> | <b>Shear and Bending Stresses</b><br>a) Shear stresses in beams: concept of shear, complimentary shear, derivation of shear stress formula, shear stress distribution for various cross sections, maximum and average shear stress for circular and rectangular sections.<br>b) Bending stresses in beams: theory of simple or pure bending, assumptions, derivation of flexure formula, bending stress distribution diagrams, Moment of Resistance of cross-section.                                                                                                                                                                                                          | 10 |
| <b>Module IV</b>  | <b>Torsion of Circular Shafts and Principal Stresses and Strains</b><br>a) <b>Torsion of circular shafts:</b> theory of torsion, assumptions, derivation of torsion formula. Stresses, strains and deformations in determinate and indeterminate shafts of hollow, solid, homogeneous cross-sections subjected to twisting moments. Power transmitted by shafts.<br>b) Principal stresses and strains: concept of principal planes and principal stresses, normal and shear stresses on an oblique plane, magnitude and orientation of principal stresses and maximum shear stress.                                                                                            | 08 |
| <b>Module V</b>   | <b>Axially and Eccentrically Loaded Columns.</b><br>a) Axially loaded columns: concept of critical load and buckling, Euler's formula for buckling load with hinged ends, concept of equivalent length for various end conditions, Rankine's formula, safe load on column and limitations of Euler's formula.<br>b) Direct and bending stresses for eccentrically loaded short column and other structural components such as retaining walls, dams, chimneys, etc. Effect of lateral force and self-weight. Resultant stress diagrams due to axial loads, uni-axial, and bi-axial bending. Concept of core of section for solid and hollow rectangular and circular sections. | 07 |

#### Text Books:

|    |                                                                                            |
|----|--------------------------------------------------------------------------------------------|
| 1. | Junnarkar S.B., 2014, "Mechanics of Structures", Charotar Publishers, Anand, 31st edition, |
| 2. | Khurmi R.S., 2018, "Strength of Material", S. Chand and Co., New Delhi                     |
| 3. | Sadhu Singh, 1978, "Strength of Materials", Khanna Publishers, N. Delhi                    |
| 4. | Ramamrutham S., 2011, "Strength of Materials", Dhanpat Rai and Sons, Delhi                 |

#### Reference Books:

|    |                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------|
| 1. | Punmia B. C., 2018, "Mechanics of Materials" Laxmi Publications, revised edition, 2016                             |
| 2. | Subramanian R., 2016, "Strength of Materials" Oxford University Press, 2nd edition                                 |
| 3. | Beer F P., Jhonston E. R., John. T. D E wolf, 2017, "Mechanics of Materials" TMH                                   |
| 4. | Jain, P. H. Theory of Structures. Khanna Publishers, New Delhi.                                                    |
| 5. | Bhavikatti, S. S. Structural Analysis. Vikas Publishing House Pvt. Ltd., New Delhi.                                |
| 6. | Passi, M. Strength of Materials (Engineering Mechanics of Solids / Mechanics of Structures, Tech-Max Publications. |



|                    |                          |            |                 |                  |
|--------------------|--------------------------|------------|-----------------|------------------|
| <b>BTPESCE302T</b> | <b>Fluid Mechanics-I</b> | <b>PCC</b> | <b>3L-0T-0P</b> | <b>3 Credits</b> |
|--------------------|--------------------------|------------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                                                                      |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To impart Knowledge of fluid properties and types of fluids.                                                                                         |
| 2.                       | To introduce the concept of fluid pressure, pressure acting on various plane and measuring pressure with the help of manometers and pressure gauges. |
| 3.                       | To impart Knowledge of Buoyancy and floatation.                                                                                                      |
| 4.                       | To build concept of Fluid kinematics and fluid dynamics with reference to fluid flow.                                                                |
| 5.                       | To learn use of notches and weirs to measure discharge. To get acquainted With dimensional analysis.                                                 |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                                                  | <b>Bloom's Taxonomy Level</b> |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | To understand the fundamental properties of fluid.                                                                                                      | K2                            |
| 2          | To understand the fluid pressure and its measurements.                                                                                                  | K2                            |
| 3          | To apply the concepts of fluid kinematics and fluid dynamics for solving engineering problems related to flow measurement and motion of fluids.         | K3                            |
| 4          | To analyze the flow characteristics through notches, weirs, orifices, and flow measuring devices using continuity, Bernoulli's, and momentum equations. | K4                            |
| 5          | To develop the ability to use dimensional analysis and similitude principles in hydraulic model studies and practical fluid engineering applications.   | K3                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Hrs</b> |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Physical properties of Fluid:</b> Definition of fluids, Fluid properties- Density, Specific weight, Specific Volume, Specific Gravity, Surface Tension, Capillarity - Adhesion and Cohesion, Newton's law of viscosity, Types of Fluids, Newtonian and Non-Newtonian Fluids, Rheological diagram, Compressibility, Vapour Pressure, Problem involving use of above fluid Properties.                                                                                                                         | 10         |
| <b>Module II</b>  | <b>Fluid Statics:</b> Concept of Pressure, Basic Equation of Hydrostatics pressure head, Pascal Law, Measurement of pressure (Atmospheric, Absolute, Gauge and Vacuum), Application of basic equation of hydrostatics- Pizometers, Principle of Manometers for balancing liquid column, Simple and Differential Manometers, Different type of Mechanical Pressure gauges<br>Total pressure, Center of Pressure for Plane and curved Surfaces, Pressure Diagrams, Practical application (Gate, Dam, lock gates). | 10         |
| <b>Module III</b> | <b>Floatation and equilibrium:</b> Principle of Buoyancy and Floatation, Equilibrium of floating bodies, Stability of Floating Bodies, Meta-center, Meta-centric height and its determination (Experimental and Analytical), Stability of Submerged Bodies.<br>Relative Equilibrium of liquids- Fluid masses subjected to uniform Horizontal / Vertical acceleration, Rotational motion- Forced and Free Vortex Flow.                                                                                           | 09         |
| <b>Module IV</b>  | <b>Fluid Kinematics and Dynamics:</b><br><b>Fluid Kinematics:</b> Methods for describing the motion of fluid; Velocity and acceleration of fluids, Type of Flow, continuity equation, continuity equation for three dimensional flow, Rotational and irrotational motion, Circulation and Vorticity, Velocity Potential, Stream function and Flow net, method of drawing flow net, use and limitation of flow net.                                                                                              | 08         |



|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                 | <b>Fluid Dynamics:</b> Forces acting on Fluid mass in motion, Eulers equation of motion along a streamline and its Integration, Bernoulli's equation, Assumptions of Bernoulli's equation, linear momentum equation and momentum equation, Application of Continuity, Bernoulli and momentum equation. Flow through orifices and mouthpieces under free and submerged condition, Venturi meter, Orifice meter, Nozzle meter, Rotameter and pitot tube.                                                                                                                                       |    |
| <b>Module V</b> | <b>Flow over Notches and weir:</b> Classification of Notches and weir, discharge over a sharp crested rectangular notch, Velocity approach, end contraction, Discharges over a Triangular notch, Trapezoidal notch, Cippoletti notch, ventilation of weir, time required to empty a tank.<br><b>Dimensional Analysis and Model Studies:</b> Dimensions of physical quantities, Dimensional homogeneity, Dimensional analysis using Buckingham's Pi theorem, important dimensionless parameter and their significance. Geometric Kinematic and Dynamic Similitude; Model laws Type of models. | 08 |

#### Text Books:

|    |                                                                                                                                                 |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Hydraulics and Fluid Mechanics including Hydraulics Machines by Dr. P. N. Modi and Dr. S. M. Seth, Standard Book House. ISBN: 978-81-89401-26-9 |
| 2. | A Textbook of Fluid Mechanics and Hydraulic Machines by Dr. R. K. Bansal, Laxmi Publications. ISBN: 978-81-31808-15-3                           |
| 3. | Fluid Mechanics including Hydraulic Machines by A. K. Jain, Khanna Publishers. ISBN: 978-81-74091-94-9                                          |
| 4. | Introduction To Fluid Mechanics by Philip J. Pritchard, John Wiley & Sons, INC. ISBN: 978-04-70547-55-7                                         |
| 5. | Theory and Applications of Fluid Mechanics by K. Subramanya, McGraw-Hill Higher Education. ISBN: 978-00-74603-69-7                              |
| 6. | Dauglas J. F., Gaisorek J. M., Swaffield J. A. "Fluid mechanics", Addison-Weisley Harlow 1999                                                   |

#### Reference Books:

|    |                                                                                                                      |
|----|----------------------------------------------------------------------------------------------------------------------|
| 1. | Introduction to Fluid Mechanics & Fluid Machines by S. K. Som & G. Biswas, Tata McGraw-Hill. ISBN: 978-00-71329-19-4 |
| 2. | Fluid Dynamics by V. L. Streeter, K. W. Bedford and E. B. Wylie, New York, McGraw-Hill.                              |
| 3. | Fluid Mechanics by K. L. Kumar, S. Chand publication.                                                                |
| 4. | R J. Garde and A. J. Mirajonkar "Fluid mechanics" SCITECH publication (India) Pvt 2010                               |

|             |           |     |          |           |
|-------------|-----------|-----|----------|-----------|
| BTPESCE303T | Surveying | PCC | 3L-0T-0P | 3 Credits |
|-------------|-----------|-----|----------|-----------|

| Course Objectives |                                                                                                                                                                 |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                | To understand the fundamental principles, concepts, classifications, and applications of surveying used in civil engineering projects.                          |
| 2.                | To apply various conventional surveying methods such as compass surveying, plane table surveying, levelling, and contouring for field measurements and mapping. |
| 3.                | To analyze errors in surveying measurements and perform necessary corrections to improve accuracy and precision in surveying operations.                        |
| 4.                | To demonstrate the use of modern surveying instruments such as theodolite, EDM, Total Station, GPS, and Remote Sensing techniques for engineering surveys.      |
| 5.                | To understand the fundamentals of GIS, DGPS and its applications in civil engineering for spatial data analysis, and decision-making.                           |

| COs | Course Outcomes                                                                                                                                       | Bloom's Taxonomy Level |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 1   | Explain the principles, objectives, classifications, and basic instruments used in surveying and geomatics engineering.                               | K2                     |
| 2   | Carry out compass, plane table, and levelling surveys and prepare field records and basic survey maps.                                                | K3                     |
| 3   | Compute and correct surveying measurements considering errors due to slope, temperature, sag, and standardization.                                    | K3                     |
| 4   | Operate theodolite, EDM, and Total Station instruments for measurement of angles, distances, and traversing operations in civil engineering projects. | K3                     |
| 5   | Describe the basic concepts of GIS, Remote Sensing, GPS and DGPS, and identify their applications in surveying.                                       | K2                     |

| Module    | Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Hrs |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Module I  | <b>Introduction and Basic Concepts of Surveying:</b> Definition and Importance of Surveying, Objectives and applications in civil engineering, Role of surveying in civil Engineering; Principles of Surveying, Conventional Symbols; Various types of Maps; Methods of Linear Measurement, Accessories for Linear Measurements, Classification of Surveying, Scales and Units, Errors in Surveying, Accuracy and precision in surveying, Basic Survey Instruments: Chains and tapes, Ranging rods, Pegs and arrows, Cross staff and optical square<br><b>Chain Surveying:</b> Principles of Chain Surveying, Methods of Ranging, Offsets. | 08  |
| Module II | <b>Plane Table Surveying:</b> Principle, Accessories of Plane Table, Methods of Plane Table Surveying, Advantages and Disadvantages of Plane Tabling.<br><b>Compass Surveying and Planimeter:</b> Principles of Compass Surveying; Types of Compasses; Bearings: Whole Circle Bearing (WCB), Quadrantal Bearing (QB); Fore Bearing and Back Bearing; Magnetic Declination; Local Attraction; Traverse Survey: Open traverse, Closed traverse.<br><b>Planimeter:</b> Definition and purpose; Types of planimeter; Principle of planimeter; Measurement of irregular areas using planimeter; Applications.                                   | 08  |

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Academic Council Meeting  
Dated :-.....13/06/2026.....



|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Module III</b> | <p><b>Levelling and Contouring:</b> Objectives and Principles of Levelling; Terms Used in Levelling: Datum, Bench Mark (BM), Reduced Level (RL), Line of collimation; Levelling Instruments: Dumpy level, Tilting level, Auto level; Levelling Staff; Methods of Levelling: Height of Instrument (HI) method, Rise and Fall method; Types of Levelling: Differential levelling, Fly levelling, Profile levelling, Cross-section levelling</p> <p><b>Contouring:</b> Definition of contour; Characteristics of contour lines; Methods of contouring: Direct method, Indirect method: Uses of Contour Maps.</p> <p><b>Theodolite Surveying and Modern Surveying:</b> Introduction to Theodolite; Definition and functions; Types of theodolites; Parts of Theodolite; Temporary and Permanent Adjustments; Measurement of Angles; Theodolite Traversing.</p> | 10 |
| <b>Module IV</b>  | <p><b>Electronic Distance Measurement (EDM) and Total Station</b></p> <p>Principles of EDM; Types of EDM instruments; Measurement of distance using electromagnetic waves; Sources of errors in EDM and corrections.</p> <p><b>Total Station:</b> Introduction to Total Station; Components and functions; Temporary adjustments and field setup; Measurement of horizontal angles, vertical angles, and distances; Traversing using Total Station; Applications of Total Station in civil engineering works; Advantages and limitations of Total Station.</p>                                                                                                                                                                                                                                                                                             | 10 |
| <b>Module V</b>   | <p><b>Basics of Geographic Information System (GIS)</b></p> <p>Introduction to GIS; Components of GIS; Spatial and non-spatial data; Raster and vector data models; Data acquisition methods; Coordinate systems and map projections; GIS data processing and analysis; Applications of GIS in civil engineering.</p> <p><b>Introduction to Remote Sensing and GPS and DGPS</b></p> <p>Basic concepts of Remote Sensing; Electromagnetic spectrum; Types of Remote Sensing; Introduction to GPS; Components and applications of GPS in surveying, applications of DGPS. Applications of drone in surveying, Applications of</p>                                                                                                                                                                                                                            | 09 |

#### Text Books:

|    |                                                                                        |
|----|----------------------------------------------------------------------------------------|
| 1. | Arora, K.R. Surveying – Volume I, II & III, Publisher: Standard Book House, New Delhi. |
| 2. | Subramanian, R. Surveying and Levelling, Publisher: Oxford University Press.           |
| 3. | Basak, N.N., Surveying and Levelling, Publisher: Tata McGraw-Hill.                     |
| 4. | Venkatramaiah, C., Textbook of Surveying, Publisher: Universities Press.               |
| 5. | Punmia, B.C., Jain, A.K., Surveying – Volume I, II and III, Laxmi Publications.        |
| 6. | Duggal S. K., Surveying Volume II, Tata McGraw-Hill Publishing Company Limited.        |
| 7. | Subramaniam R., Surveying & Levelling, Oxford University Press.                        |

#### Reference Books:

|    |                                                                                                                   |
|----|-------------------------------------------------------------------------------------------------------------------|
| 1. | Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S. V. Kulkarni, Pune Vidyarthi, Griha Prakashan. |
| 2. | Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain, Laxmi Publications.                      |
| 3. | Kanetkar T.P. and Kulkarni S.V., Surveying and Levelling – Part 2, Pune Vidyarthi Griha Prakashan, Pune.          |

  
APPROVED in.....3<sup>rd</sup>.....  
Academic Council Meeting  
Dated :-.....13/06/2026.....

|                    |                                 |            |                 |                 |
|--------------------|---------------------------------|------------|-----------------|-----------------|
| <b>BTPESCE301L</b> | <b>Mechanics of Solids Lab.</b> | <b>PCC</b> | <b>0L-0T-2P</b> | <b>1 Credit</b> |
|--------------------|---------------------------------|------------|-----------------|-----------------|

| <b>Course Objectives</b> |                                                                                                                                                       |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To understand the fundamental properties and behavior of engineering materials through standard laboratory testing methods.                           |
| 2.                       | To perform destructive and non-destructive tests on metals, timber, bricks, and flooring materials using standard testing equipment.                  |
| 3.                       | To analyze and interpret experimental results related to strength, hardness and toughness, durability, and deformation characteristics of materials.  |
| 4.                       | To develop practical skills in conducting laboratory experiments, recording observations, and preparing technical reports as per standard procedures. |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                                       | <b>Bloom's Taxonomy Level</b> |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Explain the mechanical and physical properties of engineering materials such as steel, timber, bricks, and tiles through laboratory testing. | K2                            |
| 2          | Perform various material testing experiments using standard laboratory procedures and equipment.                                             | K3                            |
| 3          | Analyze the experimental data obtained from strength, hardness, impact, and durability tests of materials.                                   | K4                            |
| 4          | Evaluate the suitability and quality of construction materials based on laboratory test results and standards.                               | K5                            |

| <b>List of Experiments</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Practical Work consists of performance of at least Ten experiments from the list below experiment:</p> <p>Experiment No 1: Tension Test on TMT Steel bar</p> <p>Experiment No 2: Shear Test on Mild Steel bar</p> <p>Experiment No 3: Compression Test on Timber</p> <p>Experiment No 4: Flexure test on timber</p> <p>Experiment No 5: Compressive Strength Test of Bricks</p> <p>Experiment No 6: Water Absorption Test on Bricks</p> <p>Experiment No 7: Efflorescence Test on Bricks</p> <p>Experiment No 8: Flexural Strength of Flooring Tiles</p> <p>Experiment No 9: Abrasion Test of Flooring Tiles</p> <p>Experiment No 10: To determine the Impact toughness (strain energy) through Izod test</p> <p>Experiment No 11: To determine the Impact toughness (strain energy) through Charpy test.</p> <p>Experiment No 12: To determine the hardness of the given specimen using Brinell hardness test</p> <p>Experiment No 13: To determine the hardness the Hardness of the given Hard steel using Rockwell hardness test.</p> |



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 Academic Council Meeting  
 Dated :- 13/06/2026.....



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|--------------------|-------------------------------|------------|-----------------|-----------------|
| <b>BTPEECE302L</b> | <b>Fluid Mechanics-I Lab.</b> | <b>PCC</b> | <b>0L-0T-2P</b> | <b>1 Credit</b> |
|--------------------|-------------------------------|------------|-----------------|-----------------|

| <b>Course Objectives</b> |                                                                                                                                                       |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To understand the fundamental properties of fluids and principles governing fluid pressure, flow measurement, and fluid motion.                       |
| 2.                       | To develop practical knowledge of hydraulic devices and instruments used for measurement of viscosity, pressure, discharge, and flow characteristics. |
| 3.                       | To verify fundamental laws and principles of fluid mechanics through laboratory experiments.                                                          |
| 4.                       | To analyze flow behavior in pipes and channels using experimental techniques and calibration methods.                                                 |
| 5.                       | To enhance experimental skills, observation, data analysis, and report preparation related to fluid mechanics and hydraulics.                         |

| <b>COs</b> | <b>Course Outcomes</b>                                                  | <b>Bloom's Taxonomy Level</b> |
|------------|-------------------------------------------------------------------------|-------------------------------|
| 1          | To understand the basic energy principles.                              | K2                            |
| 2          | To understand the use of basic measurement techniques of fluid flow.    | K2                            |
| 3          | To analyze the properties of fluids and their verification.             | K4                            |
| 4          | To understand the use the notches to measure the flow in open channels. | K2                            |
| 5          | To Evaluate the Reynolds number.                                        | K3                            |

| <b>List of Experiments</b>                                                        |
|-----------------------------------------------------------------------------------|
| Experiment No 1: Measurement of Viscosity of various fluids.                      |
| Experiment No 2: Determination of metacentric height.                             |
| Experiment No 3: Measurement of pressure Piezometer, manometers, Pressure gauges. |
| Experiment No 4: Measurement of discharge using Triangular notch.                 |
| Experiment No 5: Verification of Bernoulli's Theorem.                             |
| Experiment No 6: Calibration of an orifice / mouthpiece / orifice meter           |
| Experiment No 7: Calibration of and venturi meter.                                |
| Experiment No 8: Calibration of Rectangular notch,                                |
| Experiment No 9: Determination of Reynolds number.                                |
| Experiment No 10: Measurement of discharge -Calibration of measuring Tank.        |

|                  |                                                      |            |                 |                  |
|------------------|------------------------------------------------------|------------|-----------------|------------------|
| <b>BTPESM01T</b> | <b>MDM-1: Engineering Geology and Soil Mechanics</b> | <b>MDM</b> | <b>2L-0T-0P</b> | <b>2 Credits</b> |
|------------------|------------------------------------------------------|------------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                     |
|--------------------------|-----------------------------------------------------------------------------------------------------|
| 1.                       | To Introduce basic Knowledge of geology                                                             |
| 2.                       | To Provide Knowledge of formation of soils and rocks and their properties and sub soil exploration. |
| 3.                       | To explain the volume change behavior of soil in consolidation and compaction.                      |

| <b>COs</b> | <b>Course Outcomes</b>                                         | <b>Bloom's Taxonomy Level</b> |
|------------|----------------------------------------------------------------|-------------------------------|
| 1          | Identify and classify rocks using basic geological features.   | K2                            |
| 2          | Evaluate compaction and consolidation properties of soil.      | K4                            |
| 3          | Ability to plan the subsoil exploration for the given project. | K3                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Hrs</b> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Physical Geology and Petrology</b><br>Introduction, Geology and its branches, application in civil engineering, the earth and its parts, Geomorphology: basic principles and process like erosion, weathering, denudation etc. Geological work of atmosphere, wind, river, ground water etc.<br><b>Petrology:</b> Definition, rock cycle, Types of rocks i.e. Igneous, Sedimentary and Metamorphic rocks and their origin, texture, structure etc. Rock as a site for construction of engineering Projects like tunnels, reservoirs dams, bridges, roads etc. | 10         |
| <b>Module II</b>  | <b>Soil Properties:</b> Soil as a three-phase system, water content, density, void ratio, porosity, degree of saturation etc. and their relationship.<br>Compaction-Purpose, Mechanism of compaction, factors affecting, effects of compaction on soil properties, field compaction and compaction control.<br>Consolidation- Purpose, Consolidation process, Settlement.                                                                                                                                                                                        | 10         |
| <b>Module III</b> | <b>Subsurface Exploration:</b> Stages in subsurface exploration, depth of exploration, lateral extent of exploration, types of samples, borings for exploration- Auger, wash boring, percussion drilling and core drilling, types of samples, boring logs, core, recovery, presentation of cores etc.                                                                                                                                                                                                                                                            | 10         |

| <b>Text Books:</b> |                                                                                                                      |
|--------------------|----------------------------------------------------------------------------------------------------------------------|
| 1.                 | Prabin Singh, "Engineering and General Geology", S.K.Kataria and Sons, 2009.                                         |
| 2.                 | B.C.Punmia, Jain A.K. and Jain A.K., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 2005. |
| 3.                 | Gupte R.B, "A Text book of Engineering Geology", Pune Vidyarthi Griha Prakashan Pune.                                |
| 4.                 | Shashi K.Gulhati and Manoj Dutta, "Geotechnical Engineering", McGraw Hill Education (India) Pvt. Ltd.Chennia 2017.   |
| 5.                 | K.R. Arora, "Standard Publishers Distributers New Delhi" 2018.                                                       |



| Reference Books: |                                                                                      |
|------------------|--------------------------------------------------------------------------------------|
| 1.               | Venkat Reddy D., "Engineering Geology", Vikas Publishing House 2010.                 |
| 2.               | T.W.Lambe and Whitman, "Soil Mechanics" ,Wiley,2008.                                 |
| 3.               | Mukharjee P.K, "A text book of Geology" World Press Pvt, Ltd. Calcutta.              |
| 4.               | Das B.M, "Principles of Geotechnical Engineering" , CL Engineering, 2013.            |
| 5.               | Purshothama Raj, "Soil Mechanics and Foundation Engineering" Pearson Second Edition. |

  
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 Academic Council Meeting  
 Dated :-.....13/06/2026.....

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|------------------|----------------------------|-----------|-----------------|------------------|
| <b>BTPEOE30T</b> | <b>Applied Mathematics</b> | <b>OE</b> | <b>4L-0T-0P</b> | <b>4 Credits</b> |
|------------------|----------------------------|-----------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                                                                                  |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | Develop techniques for finding roots of non-linear equations and solving systems of linear equations.                                                            |
| 2.                       | Learn to fit polynomials to data points and interpolate values, Apply methods for numerical differentiation and numerical integration.                           |
| 3.                       | To introduce the fundamental concepts of probability theory and random variables, enabling students to model uncertainty in engineering and real-world problems. |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                                                   | <b>Bloom's Taxonomy Level</b> |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Solve transcendental and polynomial equations using bracketing methods (Bisection, Regula-Falsi) and open methods (Newton-Raphson, Secant).              | K3                            |
| 2          | Solve systems of linear equations using direct methods (Gauss Elimination) and iterative methods (Jacobi, Gauss-Seidel) with pivoting strategies.        | K2                            |
| 3          | Apply Newton's and Lagrange interpolation formulae, compute finite differences.                                                                          | K3                            |
| 4          | Solve ordinary differential equations using Euler's and Runge-Kutta methods.                                                                             | K3                            |
| 5          | Apply classical, empirical, and axiomatic definitions of probability and use addition, multiplication, and Bayes; theorems to solve probability problems | K3                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                         | <b>Hrs</b> |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Solution of Nonlinear Equations</b><br>Transcendental and polynomial equations, Bracketing methods: Bisection method, Regula-Falsi method. Open methods: Newton-Raphson method, Secant method.                                                                                                                                      | 12         |
| <b>Module II</b>  | <b>System of Linear Equations</b><br>Direct methods: Gauss Elimination, Gauss-Jordan method, Cramer's Rule. Iterative methods: Jacobi method, Gauss-Seidel method, Pivoting and scaling, Applications in engineering problems                                                                                                          | 12         |
| <b>Module III</b> | <b>Finite Difference Method</b><br>Finite differences (forward, backward, central), Newton's forward, backward and central interpolation, formulae, Lagrange interpolation, Divided difference interpolation.                                                                                                                          | 12         |
| <b>Module IV</b>  | <b>Numerical Differentiation, Integration and ODEs</b><br>Numerical differentiation using finite differences, Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule Ordinary Differential Equations: Euler's method, Modified Euler's method, Runge-Kutta methods (2 <sup>nd</sup> & 4 <sup>th</sup> order). | 12         |
| <b>Module V</b>   | <b>Probability Theory</b><br>Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes theorem of inverse probability, Properties of probabilities with proofs, Examples.                                                   | 10         |



**Text Books:**

|    |                                                                                                               |
|----|---------------------------------------------------------------------------------------------------------------|
| 1. | Numerical Methods in Engineering & Science by B. S Grewal, Khanna publication, New Delhi                      |
| 2. | Introductory Methods of Numerical Analysis S. S. Sastry, PHI Learning Pvt., 1990, 3rd edition                 |
| 3. | Fundamentals of Statistics by S. C. Gupta, Himalaya Publishing House, 7th Revised and Enlarged Edition, 2016. |

**Reference Books:**

|    |                                                                                                                                                                                   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Computer Oriented Methods by V. Rajaraman, 3rd edition, PHI publication.                                                                                                          |
| 2. | Elementary Numerical Analysis by Conte and Carl de Boor , BPB publication.                                                                                                        |
| 3. | Advanced Engineering Mathematics by E. Kreyszig, BPB publication.                                                                                                                 |
| 4. | Numerical Methods for Engineers by Steven C Chapra, 5th edition, McGraw Hill publication.                                                                                         |
| 5. | Numerical Methods for Scientific and Engineering Computations by M. K. Jain, S.R.K. Iyengar and R. K. Jain, New age international (P) Limited , Publishers, Fourth edition, 2003. |

  
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Academic Council Meeting  
Dated :-.....13/06/2026.....

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|-----------------|-------------------------------|-----------|-----------------|------------------|
| <b>BTPEOE2T</b> | <b>Business Communication</b> | <b>OE</b> | <b>4L-0T-0P</b> | <b>4 Credits</b> |
|-----------------|-------------------------------|-----------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------|
| 1.                       | To build up comprehensive understanding of business correspondence and conditions |
| 2.                       | To create influential oral, written and practical skills among students           |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                                                                                                                             | <b>Bloom's Taxonomy Level</b> |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Explain the meaning, scope, importance, and characteristics of business communication.                                                                                                                                             | K2                            |
| 2          | Demonstrate an understanding of intercultural communication, including key concepts, non-verbal communication, body language, and the relationship between language, thought, and speech in a business context.                    | K2                            |
| 3          | Explain different barriers to effective communication and listening, and demonstrate the communication principles such as the Four S's and Ten Golden Rules for effective interaction.                                             | K3                            |
| 4          | Demonstrate professional business correspondence skills by drafting business letters, emails, job application letters, resumes, and business proposals using proper structure and language.                                        | K3                            |
| 5          | Apply group communication skills in practical situations such as group discussions, interviews, meetings, conferences, and public relations, incorporating soft skills like teamwork, emotional intelligence, and problem-solving. | K3                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Hrs</b> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Introduction of Business Communication:</b> Meaning and Scope of Business Communication, Characteristics of Business Communication, Business Communication Need of Time, Five Ways to Improve your Business Communication Skills, Elements of Communication Process, Stages in Communication Process, Types of Business Communication along with example, Methods of Business Communication, Process of Characteristics of Business Communication.            | 10         |
| <b>Module II</b>  | <b>Intercultural Communication:</b> Key Terms of Intercultural Communication, Importance of Intercultural Communication in Business, Non- Verbal Communication - Introduction to Non-Verbal Communication, Aspects of Body Language, Non- Verbal Communication Codes, Thought and Speech - Introduction to Thought and Speech, Language is Ability.                                                                                                              | 12         |
| <b>Module III</b> | <b>Conceptual Barrier to Effective Communication:</b> Introduction and Types of Barriers, Physical Barriers, Mechanical Barrier, Psychological Barrier, Listening - Introduction and Definitions to Listening, Types of Listening, Barriers to Listening, Communication Rules - Simple Rules for Better Communicator, Four S's of Communication, Ten Golden Rules of Communication.                                                                              | 12         |
| <b>Module IV</b>  | <b>Business Correspondence:</b> Business Correspondence - Theory of Business Letter Writing Parts, Structure, Layouts, Principles of Effective Letter Writing, Principles of effective E - mail Writing Personnel Correspondence - Job Application Letter and Resume, Letter of Acceptance of Job Offer, Letter of Resignation. Language and Writing Skill - Paragraph Writing, Business Proposals, Oral and Written Vocabulary in Communication, Common Errors. | 12         |

  
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Academic Council Meeting  
Dated :-.....13/06/2026.....



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|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Module V</b> | <b>Group Communication:</b> Group Discussions – Process of GD, Skills tested in GD. Interviews - Preparing for an Interview, Types of Interviews – Selection, Appraisal, Grievance, Exit, online. Soft Skills – Emotional Intelligence, Conflict Management, Teamwork, Problem-Solving. Meetings - Types of Meetings, Agenda and Resolutions. Committees & Conferences. Public Relations - Meaning and Functions of Public Relations (PR), External and Internal Measures of Promoting PR, Crisis Management | 12 |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|

**Text Books:**

1. Kaul, Asha, Business Communication, Prentice-Hall of India, Delhi.

**Reference Books:**

1. Mary Ellen Guffey, Essentials of Business Communication, Sixth Edition, South-Western College Publishing.
2. Monippally, Matthukutty M. Business Communication Strategies. Tata McGraw-Hill Publishing Company Ltd., New Delhi
3. Bahl, J.C. and Nagamia, S.M. (1974) Modern Business Correspondence and Minute Writing
4. Bovee Courtland, L and Thrill, John V (1989) Business Communication, Today McGrawHill, New York, Taxman Publication.

  
 APPROVED in... 3<sup>rd</sup>...  
 Academic Council Meeting  
 Dated :- 13/06/2026...

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|------------------|--------------------------------------------|-----------|-----------------|------------------|
| <b>BTPEOE13T</b> | <b>Employability and Skill Development</b> | <b>OE</b> | <b>4L-0T-0P</b> | <b>4 Credits</b> |
|------------------|--------------------------------------------|-----------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                                                  |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | Develop employability skills among mechanical engineering students and Enhance communication, teamwork, and professional ethics. |
| 2.                       | Build technical aptitude related to manufacturing, maintenance, quality, and industrial practices.                               |
| 3.                       | Prepare students for internships, placements, and industrial environments.                                                       |

| <b>COs</b> | <b>Course Outcomes</b>                                                                 | <b>Bloom's Taxonomy Level</b> |
|------------|----------------------------------------------------------------------------------------|-------------------------------|
| 1          | Demonstrate effective communication and interpersonal skills in professional settings. | K2                            |
| 2          | Apply aptitude, analytical, and problem-solving skills for employment opportunities.   | K3                            |
| 3          | Understand industrial practices, workplace safety, and engineering ethics.             | K2                            |
| 4          | Develop technical employability skills relevant to mechanical engineering industries.  | K2                            |
| 5          | Demonstrate entrepreneurship, leadership, and lifelong learning abilities.             | K2                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Hrs</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Communication Skills and Personality Development:</b> Fundamentals of professional communication, Verbal and non-verbal, communication Technical communication and workplace etiquette, Group discussion techniques Presentation skills and public speaking, Resume writing and cover letter preparation, Interview skills and mock interview practices, Personality development and confidence building.                                    | 10         |
| <b>Module II</b>  | <b>Quantitative Aptitude and Problem-Solving Skills:</b> Quantitative aptitude fundamentals, Numerical ability and logical reasoning, Analytical thinking and decision making, Basic data interpretation, Engineering problem-solving techniques, Time management and critical thinking, Introduction to psychometric and aptitude tests for placements.                                                                                        | 12         |
| <b>Module III</b> | <b>Industrial Skills, Safety and Professional Ethics:</b> Industrial work culture and organizational behaviour, Basics of industrial safety practices, Occupational health and hazard identification, Safety standards in mechanical workshops, Introduction to quality concepts (5S, Kaizen, Lean Manufacturing), Professional ethics and workplace discipline, Engineering ethics and sustainable practices.                                  | 12         |
| <b>Module IV</b>  | <b>Technical Employability Skills:</b> Automation and Smart Manufacturing, Internet of Things (IoT) Basics, Green Engineering and Sustainable Technologies, Artificial Intelligence basics. Industrial automation and Industry 4.0 overview, Preventive and predictive maintenance concepts, Quality control tools and inspection techniques, Documentation and report writing.).                                                               | 12         |
| <b>Module V</b>   | <b>Entrepreneurship, Innovation and Career Development:</b> Concept and Meaning of Entrepreneurship, Characteristics and Types of Entrepreneurs, Entrepreneurship development, Role of Entrepreneurship in Economic Development Start-up ecosystem and innovation, Career planning and higher education opportunities, Professional networking and digital platforms, Leadership and teamwork skills, Internship and project management basics. | 12         |



**Text Books:**

|    |                                                                                |
|----|--------------------------------------------------------------------------------|
| 1. | Sanjay Kumar & Pushp Lata, Communication Skills –Oxford University Press.      |
| 2. | S. P. Dhanavel, Soft Skills – Orient Black Swan.                               |
| 3. | R. S. Aggarwal, S. Chand., Quantitative Aptitude for Competitive Examinations. |
| 4. | Charles E. Harris Jr., Engineering Ethics –Cengage Learning.                   |
| 5. | S. S. Khanka, S. Chand., Entrepreneurship Development.                         |

**Reference Books:**

|    |                                                                                     |
|----|-------------------------------------------------------------------------------------|
| 1. | Barun K. Mitra, Personality Development and Soft Skills –, Oxford University Press. |
| 2. | Dr. M. Sen Gupta.Skills for Employability.                                          |
| 3. | L. M. Deshmukh.,Industrial Safety Management.                                       |
| 4. | Stephen R. Covey The 7 Habits of Highly Effective People.                           |

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| <b>BTPESCE306T</b> | <b>Economics for Engineers</b> | <b>HSSM</b> | <b>1L-0T-0P</b> | <b>1 Credit</b> |
|--------------------|--------------------------------|-------------|-----------------|-----------------|

| <b>Course Objectives</b> |                                                                                            |
|--------------------------|--------------------------------------------------------------------------------------------|
| 1.                       | To enable students to understand the economics the principle applicable to engineering.    |
| 2.                       | To learn the techniques of economic decision making                                        |
| 3.                       | To give knowledge to students about various cost for determining manufacturing of product. |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                        | <b>Bloom's Taxonomy Level</b> |
|------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Define the basic concept of micro and macroeconomics, engineering economics and their application in engineering              | K2                            |
| 2          | Evaluate numerically the effect of changes in demand and supply on price determination of products and services.              | K2                            |
| 3          | Analyze the macro economy environment and financial system of the country and its impact on business, society and enterprise. | K4                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Hrs</b> |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | Engineering economics- nature and scope, Basic problems of an economy, Micro economics and macro economics,<br>Demand- meaning of demand, demand function law of demand and its exception, elasticity of demand, and its measurement, demand forecasting.<br>Supply- Meaning of supply, Law of supply and its exception, elasticity of supply, determination of market equilibrium.                                                                                                                                                                | 05         |
| <b>Module II</b>  | Production- Production function, laws of return, law of variable proportion, law of returns to scale. Cost and revenue concept- Total cost, fixed cost, Variable cost, total revenue, average revenue, marginal revenue, cost output relationships in the short run and long run, analysis of cost minimization, lifecycle cost analysis. Firms' behavior under- competitive market, monopoly, monopolistic competition and oligopoly                                                                                                              | 05         |
| <b>Module III</b> | Market- Basic understanding of different market structure, determination of equilibrium price under perfect competition, break even analysis- linear approach, International trade, terms of trade, gain from international trade, free trade vs Protection, dumping and balance of payment.<br>Inflation- Meaning, types, causes, measures to control inflation.<br>Evaluation of engineering project- Present worth method, future worth method, annual worth method, internal rate of return method, cost benefits analysis for public project. | 05         |

| <b>Text Books:</b> |                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------|
| 1.                 | Ruder Dutt and Sundaram, " Indian economy" , S. Chand.                                           |
| 2.                 | Chan S. Park, " Fundamentals of Engineering Economics" , Always Learning.                        |
| 3.                 | W. J. Sullivan, E. M. Wicks, C. patric koelling, " Engineering Economy" , Pearson.               |
| 4.                 | Seema Singh , "Economics for Engineering Students" , IK international publishing house pvt. Ltd. |



| Reference Books: |                                                                                |
|------------------|--------------------------------------------------------------------------------|
| 1.               | Riggs, Bedworth and Randhw, "Engineering Economics", MCG Hill education India. |
| 2.               | R Paneer Seelvan, "Engineering Economics", PHI.                                |
| 3.               | Ahuja H. L., "Principles of Micro economics", S. Chand and company ltd.        |
| 4.               | S. P. Gupta, "Macro Economics", TMH                                            |

  
 Page 25 of 50  
 APPROVED in... 3<sup>rd</sup>   
 Academic Council Meeting  
 Dated :- 13/06/2026

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|------------------|-------------------------------|------------|-----------------|------------------|
| <b>BTPESUHVT</b> | <b>Universal Human Values</b> | <b>VEC</b> | <b>3L-0T-0P</b> | <b>3 Credits</b> |
|------------------|-------------------------------|------------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                                                                                                                                           |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To develop right understanding through self-exploration and cultivate harmony with self, society, and nature, enabling students to apply universal human values and ethical principles in personal and professional life. |

| <b>COs</b> | <b>Course Outcomes</b>                                                                          | <b>Bloom's Taxonomy Level</b> |
|------------|-------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Analyse self and surroundings to understand personal and societal harmony.                      | K2                            |
| 2          | Evaluate human aspirations and happiness to enhance well-being.                                 | K2                            |
| 3          | Assess universal values in relationships and design strategies for trust, respect, and justice. | K2                            |
| 4          | Analyse human impact on nature and propose sustainable practices.                               | K3                            |
| 5          | Evaluate eco-friendly systems and develop strategies for sustainable technologies.              | K2                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Hrs</b> |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Introduction:</b> Purpose and motivation for the course. Self-Exploration, 'Natural Acceptance' and Experiential Validation. Continuous Happiness and Prosperity. Right understanding, Relationship and Physical Facility. Understanding Happiness and Prosperity correctly. Understanding and living in harmony at various levels.                                                                                                                                                                                                                                                                         | 07         |
| <b>Module II</b>  | <b>Understanding Harmony:</b> Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health, correct appraisal of Physical needs. Prosperity in detail, Programs to ensure Sanyam and Health.                                                                  | 08         |
| <b>Module III</b> | <b>Values in relationships:</b> Understanding nine universal values in human-human relationship. Justice and program for its fulfilment to ensure mutual happiness. Trust and Respect as the foundational values of relationship, difference between intention and competence, respect and differentiation. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. | 10         |
| <b>Module IV</b>  | <b>Co-existing with nature:</b> Understanding the harmony in Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Coexistence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence. Human being as cause of imbalance in nature, pollution, depletion of resources and role of technology etc.                                                                                                                                                 | 10         |
| <b>Module V</b>   | <b>Holistic approach for Engineers:</b> Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education. Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order. b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems. c. Ability to identify and develop appropriate                                                                                                             | 10         |

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 APPROVED in.....3<sup>rd</sup>.....  
 Academic Council Meeting  
 Dated :-.....13/06/2026.....



|  |                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers. b. At the level of society: as mutually enriching institutions and organizations |  |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Text Books:**

|    |                                                                                            |
|----|--------------------------------------------------------------------------------------------|
| 1. | Human Values and Professional Ethics, Gaur, Sangal, Bagaria, 2010, Excel Books, New Delhi. |
|----|--------------------------------------------------------------------------------------------|

**Reference Books:**

|    |                                                                                   |
|----|-----------------------------------------------------------------------------------|
| 1. | Jeevan Vidya: Ek Parichaya, A. Nagaraj, 1999, Jeevan Vidya Prakashan, Amarkantak  |
| 2. | Human Values, A.N. Tripathi, 2004, New Age Intl. Publishers, New Delhi            |
| 3. | The Story of My Experiments with Truth, M.K.Gandhi, 2009, Fingerprint Publishers. |



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Academic Council Meeting  
Dated :-...13/06/2026.....

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|--------------------|---------------------------------|-----------|-----------------|-----------------|
| <b>BTPESCE303L</b> | <b>Surveying/ Field Project</b> | <b>FP</b> | <b>0L-0T-2P</b> | <b>1 Credit</b> |
|--------------------|---------------------------------|-----------|-----------------|-----------------|

| <b>Course Objectives</b> |                                                                                                                                                                   |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To understand the principles, instruments, and methods used in compass, plane table, levelling and contour surveying, and to study GPS, DGPS and drone surveying. |
| 2.                       | To develop practical skills in conducting field surveys and collecting accurate measurements using conventional and modern surveying instruments.                 |
| 3.                       | To prepare survey maps, field books, traverse plots, contour maps, and area calculations from observed field data.                                                |
| 4.                       | To analyze survey observations and determine reduced levels, bearings, coordinates, and irregular areas using appropriate methods.                                |
| 5.                       | To familiarize students with advanced surveying techniques such as GPS, EDM, Total Station, and theodolite surveying for engineering applications.                |

| <b>COs</b> | <b>Course Outcomess</b>                                                                                                           | <b>Bloom's Taxonomy Level</b> |
|------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Perform plane table surveying, and compass surveying also study GPS, DGPS and drone surveying.                                    | K3                            |
| 2          | Determine reduced levels, prepare level field books, and conduct contouring for terrain representation.                           | K3                            |
| 3          | Measure horizontal and vertical angles, distances, and coordinates using theodolite, EDM, GPS, and Total Station instruments.     | K3                            |
| 4          | Compute bearings, irregular areas, and survey data accurately using standard surveying procedures and instruments.                | K3                            |
| 5          | Interpret and evaluate field survey data for road surveys, contouring, and traversing applications in civil engineering projects. | K4                            |

| <b>List of Practical's</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Perform each of the following practical work</b></p> <ol style="list-style-type: none"> <li>1. Plane Table Survey: Radiation and Intersection Method</li> <li>2. Compass Surveying: Measurement of bearings using prismatic compass and plotting of traverse.</li> <li>3. Measurement of irregular area using planimeter.</li> <li>4. Levelling: Determination of reduced levels and preparation of level field book.</li> <li>5. Study drone for surveying</li> <li>6. Study DGPS for surveying</li> </ol> <p><b>Among following any two shall be performed</b></p> <ol style="list-style-type: none"> <li>1. Demonstration of GPS survey and collection of field coordinates.</li> <li>2. Theodolite Surveying: Measurement of horizontal and vertical angles using theodolite.</li> <li>3. Study and demonstration of Electronic Distance Measurement (EDM) instrument.</li> <li>4. Total Station: Measurement of angle and distance.</li> </ol> <p><b>Among following two shall be performed</b></p> <ol style="list-style-type: none"> <li>1. Road survey; 2. Radial Contouring; 3. Block Contouring; 4. Theodolite Traversing</li> </ol> |

  
APPROVED in.....3<sup>rd</sup>.....  
Academic Council Meeting  
Dated :-.....13/06/2026.....



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|--------------------|-------------------------------------------|------------|-----------------|------------------|
| <b>BTPEECE401T</b> | <b>Building Construction and Planning</b> | <b>PCC</b> | <b>3L-0T-0P</b> | <b>3 Credits</b> |
|--------------------|-------------------------------------------|------------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                                                                      |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To introduce the fundamental components of building construction.                                                                                    |
| 2.                       | To develop understanding of different types of roofs, floors, plastering techniques, and structural support.                                         |
| 3.                       | To familiarize students with the principles of building planning and space planning based on anthropometry.                                          |
| 4.                       | To Explain green building concepts,                                                                                                                  |
| 5.                       | To enable students to apply building planning principles and services for the design of safe, functional, and environmentally sustainable buildings. |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                                                                          | <b>Bloom's Taxonomy Level</b> |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | To introduce the basic concepts of building construction, components of buildings, foundations, masonry, doors, windows, arches, lintels, and staircases.                       | K2                            |
| 2          | To develop understanding of roofs, floors, plastering, damp proofing, shoring, underpinning, and scaffolding used in building construction.                                     | K2                            |
| 3          | To explain the principles of building planning, building bye-laws, orientation, anthropometry, and planning considerations for different types of residential buildings.        | K3                            |
| 4          | To analyze the concepts of green buildings, acoustics, sound insulation, and noise control techniques for sustainable and comfortable buildings.                                | K4                            |
| 5          | To understand various building services such as plumbing, drainage, electrification, ventilation, fire protection, air conditioning, and thermal insulation in modern buildings | K3                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Hrs</b> |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Building Construction</b><br>Introduction, Types of building, Components of building, Design loads, Types of Structure, Types of Foundations, Masonry Construction: Stone masonry and Brick Masonry, composite masonry, various types of Arches and Lintels, Doors and windows of different types, Staircase and their types.                                                                                                                                                      | 08         |
| <b>Module II</b>  | <b>Roofs, Floors, Plastering and Support Systems</b><br>Roofs and their types, various types of flooring, Plasters and Coloring, Shoring, Underpinning and scaffolding, Damp proofing.                                                                                                                                                                                                                                                                                                | 07         |
| <b>Module III</b> | <b>Building planning principles</b><br>Principles of building planning orientation, sun diagram and wind diagram orientation of building in different climatic zones different types of buildings and planning considerations for apartment, bungalow, row-house and twin bungalow. Building Byelaws- open space, height, size of building, parking, garden, toilet etc,<br>Anthropometry: study of human dimensions, space required for various simple activity, circulation spaces. | 10         |
| <b>Module IV</b>  | <b>Green Building and Acoustics</b><br>Green building or sustainable building- concept, principle, benefits, criteria, Energy efficiency materials etc. assessment, evaluation and green building certification<br>Acoustics: absorption of sound various materials, sabine's formula, optimum reverberation time,                                                                                                                                                                    | 10         |

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Academic Council Meeting  
Dated :-.....13/06/2026.....

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|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                 | conditions for good acoustics, sound insulation, acceptable noise level, noise prevention at source, transmission of noise, noise control general consideration                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |
| <b>Module V</b> | <b>Building Services</b><br>Plumbing- water supply, sanitary fittings, systems of plumbing, Drainage of house, drainage plans of buildings, septic tanks and their design, introduction to rainwater harvesting.<br>Electrification: requirements & location of various points, and concept of earthing concealed and open wiring<br>Ventilation- natural and artificial, Air conditioning<br>Fire Protection – Fire hazards, fire loads, fire resisting materials, fire safety requirements, fire extinguishing equipment's.<br>Thermal Insulation – Introduction, methods of insulation, thermal insulating materials for wall and roofs. | 10 |

#### Text Books:

|    |                                                                                                    |
|----|----------------------------------------------------------------------------------------------------|
| 1. | Punmia B.C., Jain A. K., 2008, "Building Construction", Laxmi Pub. Pvt. Ltd., 10th Edi, N. Delhi   |
| 2. | Arora S. P. and Bindra S. P., 2010, "Text Book of Building Construction", Dhanpat Rai Publications |
| 3. | Kumar Sushil, 2010, "Building Construction" Standard Publishers, 20th Edition.                     |
| 4. | P. Purushothama Raj, 2016, "Building Construction Materials and Techniques", Pearson Education     |
| 5. | Jain V.K., 2015, "Automation Systems in Smart and Green Buildings" ISBN NO: 978-81-7409-237-3      |

#### Reference Books:

|    |                                                                                                                                                                                                                                                             |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | NBC 2005, National Building Code of India, Parts III, IV, VII and IX, B.I.S. New Delhi                                                                                                                                                                      |
| 2. | Chudley R., 1973, "Construction Technology", Vol.1, 2, 3 and 4 ELBS Publisher                                                                                                                                                                               |
| 3. | SP 7- National Building Code Group 1 to 5, B.I.S. New Delhi                                                                                                                                                                                                 |
| 4. | I.S. 962 - 1989 Code for Practice for Architectural and Building Drawings, B.I.S. New Delhi                                                                                                                                                                 |
| 5. | Sikka V. B., 2015, "A Course in Civil Engineering Drawing", S. K. Kataria and Sons Catalogues. Information Brochures, Trade Literature by material or product manufacturers Mehta, Scarborough, Armpriest, 2007, "Building Construction", Pearson Education |

  
APPROVED in.....3<sup>rd</sup>.....  
Academic Council Meeting  
Dated :-.....13/06/2026.....



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|--------------------|------------------------------|------------|-----------------|------------------|
| <b>BTPESCE402T</b> | <b>Theory of Structure-I</b> | <b>PCC</b> | <b>3L-0T-0P</b> | <b>3 Credits</b> |
|--------------------|------------------------------|------------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                |
|--------------------------|------------------------------------------------------------------------------------------------|
| 1.                       | To learn various methods to estimate deflection of beams                                       |
| 2.                       | To learn Energy methods to solve structural system.                                            |
| 3.                       | To learn Compatibility methods to solve indeterminate structures                               |
| 4.                       | To learn Determination of Continuous and end support moments of indeterminate beams and frames |
| 5.                       | To learn slope deflection method for analysis of structures                                    |

| <b>COs</b> | <b>Course Outcomes</b>                                                                         | <b>Bloom's Taxonomy Level</b> |
|------------|------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Describe the concept of structural analysis, degree of indeterminacy.                          | K2                            |
| 2          | Calculate slopes and deflection at various locations for different types of beams.             | K3                            |
| 3          | Identify determinate and indeterminate trusses and calculate forces in the members of trusses. | K4                            |
| 4          | Perform the distribution of the moments the in continuous beam and frame.                      | K3                            |
| 5          | Calculate the deformations in frames.                                                          | K3                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Hrs</b> |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Deflections of Beams:</b> Calculation of Slope and Deflection for determinate beams by Double integration method, Macaulay's method, Moment area method, Conjugate beam method.                                                                                                                                                                                                                                                                                                                           | 08         |
| <b>Module II</b>  | <b>Deflection of Beam and rigid frame by Strain Energy Method:</b> Strain Energy due to Bending, Virtual Work, Unit Load Method, Castigliano's Theorems, Maxwell's reciprocal theorem. Analysis of redundant trusses by unit load method for external loading, Deflection due to sinking of support and temperature changes.                                                                                                                                                                                 | 10         |
| <b>Module III</b> | <b>Method of Consistence Deformation:</b> Different Structural systems, concept of analysis, basic Assumptions, indeterminacy, Castigliano's theorem Indeterminate Beams, Analysis of Indeterminate Beams, Propped Cantilever and Fixed Beams-Fixed End Moments and reactions for standard cases of loading- slopes and deflections in fixed beams. Claypeyron's Three Moment Theorems for continuous beam, analysis of continuous beams settlement effects, thermal effect, SFD & BMD for continuous beams. | 10         |
| <b>Module IV</b>  | <b>Moment Distribution Method:</b> a) Stiffness factor, carry over factor, distribution factor, application of Moment distribution method of analysis to beams with and without joint translation and yielding of support, application to non-sway rigid jointed rectangular portal frames, shear force and bending moment diagram. b) Sway analysis of rigid jointed rectangular single bay single storey portal frames using Moment distribution method.                                                   | 10         |
| <b>Module V</b>   | <b>Slope Deflection Method:</b> Analysis of continuous beams, analysis of rigid frames, frames without sway and with sway, settlement effects.                                                                                                                                                                                                                                                                                                                                                               | 07         |

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Academic Council Meeting  
Dated :-.....13/06/2026.....

**Text Books:**

|    |                                                                                                                             |
|----|-----------------------------------------------------------------------------------------------------------------------------|
| 1. | S. S. Bhavikatti (2011), "Structural Analysis", Vikas Publishing House PVT. Ltd. Noida, ISBN 8125942696, 436 pages          |
| 2. | R.S.Khurmi(2016), "Theory of Structures. Chand Publishing & Company Pvt. Ltd. New Delhi,ISBN: 978-81-219-0520-6, 710 Pages. |
| 3. | Reddy C.S. (1999), "Basic Structural Analysis", Tata McGraw hill, ISBN 0070702764, 540 pages.                               |
| 4. | Junnarkar S.B. (2013), "Structural Analysis, Vol. II" Charotar Publishers ISBN 9380358703, 986 pages.                       |
| 5. | Popov, Egor P, (1978), "Mechanics of materials", Englewood Cliffs, N.J: Prentice Hall, ISBN 0135711584, 864 pages.          |
| 6. | Bear & Johnson (2007), "Mechanics of materials", Tata McGraw-Hill, ISBN: 0070042845, 780 pages.                             |

**Reference Books:**

|    |                                                                                                                                              |
|----|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Timoshenko & Gere (2006), "Mechanics of Materials", Tata McGraw Hill, CBS Publishers & Distributors, ISBN 8123908946, 762 pages.             |
| 2. | Stephen P. Timoshenko, Donovan H. Young (1965), "Theory of Structures", Tata McGraw Hill, ISBN 0070648689, 629 pages.                        |
| 3. | John Benson Wilbur, Senol Utku, Charles H. Norris (1990), "Elementary Structural Analysis", Tata McGraw Hill, ISBN 9780070659339, 829 pages. |
| 4. | Harold I. Laursen (2007), "Structural Analysis", Tata McGraw Hill Higher Education, ISBN 0070366438, 468 pages.                              |
| 5. | B.G. Neal (1963), "Structural Theorems and Their Applications", Pergamon Press ISBN 0080108717, 208 pages.                                   |
| 6. | Russell C. Hibbeler (2012), "Structural Analysis", Prentice Hall, IBN 013257053X, 695 pages.                                                 |
| 7. | Alexander Chajes (1982), "Structural Analysis", Longman Higher Education, ISBN 0138534080, 352 pages.                                        |
| 8. | Aslam Kassimali (2014), "Structural Analysis", Cengage Learning, ISBN 1133943896, 613 pages.                                                 |
| 9. | Dr. Ramachandran Vaidyanathan, Dr. P. Perumal (2006), "Comprehensive Structural Analysis", Laxmi Publications, ISBN 8170088917, 466 pages.   |



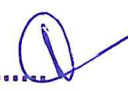
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|-------------|--------------------|-----|----------|-----------|
| BTPEECE403T | Fluid Mechanics-II | PCC | 3L-0T-0P | 3 Credits |
|-------------|--------------------|-----|----------|-----------|

| Course Objectives |                                                                              |
|-------------------|------------------------------------------------------------------------------|
| 1.                | To build concept of laminar and turbulent flow                               |
| 2.                | To make aware of boundary layer theories and flow around submerged bodies.   |
| 3.                | To impart the knowledge of fluid flow through open channels and closed pipes |
| 4.                | To introduce the concept of varied flow and its use.                         |
| 5.                | To get acquainted of hydraulic machineries.                                  |

| COs | Course Outcomes                                                                                | Bloom's Taxonomy Level |
|-----|------------------------------------------------------------------------------------------------|------------------------|
| 1   | Understand the boundary layer theories and its application                                     | K2                     |
| 2   | Explain the turbulent flow and its use in pipe flow, Losses in pipe, analysis of pipe network. | K2                     |
| 3   | To compute the force exerted by jet on stationary and moving vanes,                            | K3                     |
| 4   | Explain the difference between gradually varied flow and rapid varied flow.                    | K2                     |
| 5   | Understand the concept of hydraulic turbine and their classification.                          | K2                     |

| Module            | Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Hrs |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| <b>Module I</b>   | <b>Laminar Flow and Boundary layer Theory</b><br><b>Laminar Flow:</b> Reynolds Experiment, Laminar Flow through a circular pipe, Flow between two fixed parallel plates, Stokes law, Methods of measurement of viscosity, Transition from laminar to turbulent flow.<br><b>Boundary Layer Theory: Development of boundary layer on a flat plate,</b> Nominal, Displacement, momentum and energy thickness. Laminar, turbulent and transitional boundary layer, Application of momentum equation for boundary layer development, Local and mean drag coefficient, Hydro dynamically smooth and rough boundaries, Boundary layer separation and its control.                                                                                                                                                                                                                                                                                                                                                                                        | 10  |
| <b>Module II</b>  | <b>Flow through pipes and turbulent flow</b><br><b>Flow through pipes:</b> Energy losses in pipe flow (major and minor), Hydraulic gradient and total energy line, Flow through pipes such as simple, compound, parallel, branched pipes and siphons, Dupit's equation, Hydraulic transmission of power through pipes, introduction to three reservoir problem and pipe network.<br><b>Turbulent Flow:</b> Characteristics of turbulent flow, instantaneous velocity, temporal velocity, Scale of turbulence and intensity of turbulence, semi-empirical theories to estimate shear stress in turbulent flow using Boussinesq's theory, Prandtl's mixing length theory, velocity distribution in turbulent flow, Prandtl's velocity distribution equation, Karman Prandtl velocity distribution equation for smooth and rough boundaries, Equation for mean velocity for pipes, Darcy Flow; Nikuradse's experiments on artificially roughened pipe, friction factor for commercial pipes. Moody's diagram, explicit equation for friction factor. | 10  |
| <b>Module III</b> | <b>Open Channel Flow:</b> Introduction, Difference between pipe flow and open channel flow, types of open channel, types of flow in open channel, geometric elements, Chezy's and Manning's Formula, Hydraulically efficient section- considerations for Rectangular, Triangular, Trapezoidal and circular                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 09  |

Page 33 of 50

  
 APPROVED in.....3<sup>rd</sup>.....  
 Academic Council Meeting  
 Dated :-...13/06/2024.....

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |    |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                  | <p>section</p> <p>Concept of specific energy and specific force – Sub critical, Super critical Flow, gradually varied flow- Definition, classification of channel slopes, dynamic equation G.V.F., Back water curve and afflux.</p> <p>Rapidly Varied Flow- Definition, Examples, Hydraulic Jump-phenomenon, Parameters, uses, types of Hydraulic jump.</p>                                                                                                                                                                                                                                         |    |
| <b>Module IV</b> | <b>Impact of Jet:</b> Impulse Momentum principle, impact of jet on vanes- Flat, curved (Stationary and Moving), inlet and outlet velocity triangle under various condition, series of flat, curved Vanes mounted on wheels.                                                                                                                                                                                                                                                                                                                                                                         | 08 |
| <b>Module V</b>  | <b>Hydraulics Machines:</b> Turbines: importance of hydropower, Classification of turbine, description, typical dimensions and working principle of Pelton, Francis, and Kaplan Turbine (Detailed Design need not to be dealt with), module quantities, Specific speed, Performance Characteristics, Selection of types of turbines, Description and function of draft tube, Thomas's Cavitation number. Pumps- Classification, component parts, working of centrifugal pump, performance characteristics, selection of pumps, common pump troubles and remedies, introduction to submersible pump. | 08 |

#### Text Books:

|    |                                                                                                                                                 |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Hydraulics and Fluid Mechanics including Hydraulics Machines by Dr. P. N. Modi and Dr. S. M. Seth, Standard Book House. ISBN: 978-81-89401-26-9 |
| 2. | A Textbook of Fluid Mechanics and Hydraulic Machines by Dr. R. K. Bansal, Laxmi Publications. ISBN: 978-81-31808-15-3                           |
| 3. | Fluid Mechanics including Hydraulic Machines by A. K. Jain, Khanna Publishers. ISBN: 978-81-74091-94-9                                          |
| 4. | Introduction To Fluid Mechanics by Philip J. Pritchard, John Wiley & Sons, INC. ISBN: 978-04-70547-55-7                                         |
| 5. | Theory and Applications of Fluid Mechanics by K. Subramanya, McGraw-Hill Higher Education. ISBN: 978-00-74603-69-7                              |
| 6. | Dauglas J. F., Gaisorek J. M., Swaffield J. A. "Fluid mechanics", Addison-Weisley Harlow 1999                                                   |
| 7. | Flow in Open channels by K. Subramanya, McGraw-Hill Higher Education.                                                                           |

#### Reference Books:

|    |                                                                                                                      |
|----|----------------------------------------------------------------------------------------------------------------------|
| 1. | Introduction to Fluid Mechanics & Fluid Machines by S. K. Som & G. Biswas, Tata McGraw-Hill. ISBN: 978-00-71329-19-4 |
| 2. | Fluid Dynamics by V. L. Streeter, K. W. Bedford and E. B. Wylie, New York, McGraw-Hill.                              |
| 3. | Fluid Mechanics by K. L. Kumar, S. Chand publication.                                                                |
| 4. | R J. Garde and A. J. Mirajonkar "Fluid mechanics" SCITECH publication ( India) Pvt 2010                              |



|                    |                            |            |                 |                  |
|--------------------|----------------------------|------------|-----------------|------------------|
| <b>BTPESCE404T</b> | <b>Concrete Technology</b> | <b>PCC</b> | <b>3L-0T-0P</b> | <b>3 Credits</b> |
|--------------------|----------------------------|------------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                  |
|--------------------------|------------------------------------------------------------------|
| 1.                       | To understand properties of ingredients of concrete.             |
| 2.                       | To study fresh and hardened concrete behavior.                   |
| 3.                       | To learn admixtures and special concretes.                       |
| 4.                       | To understand durability and structural performance of concrete. |
| 5.                       | To apply mix design and quality control techniques in practice.  |

| <b>COs</b> | <b>Course Outcomes</b>                                | <b>Bloom's Taxonomy Level</b> |
|------------|-------------------------------------------------------|-------------------------------|
| 1          | Explain properties of concrete ingredients            | K2                            |
| 2          | Analyze fresh concrete properties and workability     | K4                            |
| 3          | Evaluate hardened concrete strength and durability    | K5                            |
| 4          | Apply knowledge of admixtures and special concretes   | K3                            |
| 5          | Design concrete mix and perform quality control tests | K6                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Hrs</b> |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Ingredients of Concrete</b><br>Cement: manufacturing process, physical properties, hydration process, hydration products, chemical compounds in cement, types of cement.<br>Aggregates: classification, physical and mechanical properties, fineness, gradation using sieve analysis, tests on aggregates. Water: specifications, quality requirements for mixing water, effects of impurities.                                      | 07         |
| <b>Module II</b>  | <b>Properties of Fresh Concrete</b><br>Nominal mix concrete, batching methods, mixing, transportation, placing (including pumping), and compaction techniques. Workability: definition, factors affecting workability, methods of measurement. Segregation, bleeding, setting time, curing methods, types of curing, temperature effects on fresh concrete.                                                                             | 08         |
| <b>Module III</b> | <b>Properties of Hardened Concrete</b><br>Strength and durability of concrete, characteristic strength. Compressive, tensile, and flexural strength tests. Stress-strain relationship, modulus of elasticity. Effect of water-cement ratio and admixtures on strength. Creep and shrinkage. Durability issues: minimum and maximum cement content, exposure conditions. Cracks in concrete, sulphate attack, alkali-aggregate reaction. | 10         |
| <b>Module IV</b>  | <b>Admixtures and Special Concretes</b><br>Admixtures: role, classification, accelerators, retarders, plasticizers, superplasticizers. Mineral admixtures: fly ash, silica fume, GGBS. Special concretes: lightweight concrete, self-compacting concrete (SCC), high density concrete, fiber reinforced concrete (FRC), high strength concrete, high performance concrete (HPC), geopolymer concrete, ferrocement.                      | 10         |
| <b>Module V</b>   | <b>Concrete Mix Design and Quality Control</b><br>Factors governing mix design, methods of mix design, factors affecting mix design. Expression of proportions, trial mixes, acceptance criteria. Quality control in concrete construction, factors causing                                                                                                                                                                             | 10         |

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**Academic Council Meeting**  
**Dated :-.....13/06/2026.....**

|  |                                                                                                                                      |  |
|--|--------------------------------------------------------------------------------------------------------------------------------------|--|
|  | variations. Quality measurement in construction. Non-destructive testing: rebound hammer test, ultrasonic pulse velocity (UPV) test. |  |
|--|--------------------------------------------------------------------------------------------------------------------------------------|--|

**Text Books:**

|    |                                                                  |
|----|------------------------------------------------------------------|
| 1. | M.S. Shetty – <i>Concrete Technology</i> , S. Chand Publications |
| 2. | A.M. Neville – <i>Properties of Concrete</i> , Pearson Education |
| 3. | M.L. Gambhir – <i>Concrete Technology</i> , McGraw Hill          |

**Reference Books:**

|    |                                                                         |
|----|-------------------------------------------------------------------------|
| 1. | IS 456:2000 – Code of Practice for Plain and Reinforced Concrete        |
| 2. | P.K. Mehta – <i>Concrete: Microstructure, Properties and Materials</i>  |
| 3. | A.R. Santhakumar – <i>Concrete Technology</i> , Oxford University Press |
| 4. | IS 10262 – Concrete Mix Proportioning Guidelines                        |



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 Academic Council Meeting  
 Dated :-.....13/06/2026.....



|                    |                                               |            |                 |                 |
|--------------------|-----------------------------------------------|------------|-----------------|-----------------|
| <b>BTPESCE401L</b> | <b>Building Construction and Planning Lab</b> | <b>PCC</b> | <b>0L-0T-2P</b> | <b>2 Credit</b> |
|--------------------|-----------------------------------------------|------------|-----------------|-----------------|

| <b>Course Objectives</b> |                                                                                                                                                    |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To develop understanding of building planning and preparation of various architectural and municipal drawings.                                     |
| 2.                       | To impart practical knowledge of drafting techniques used in civil engineering and building construction.                                          |
| 3.                       | To enable students to prepare detailed building drawings such as plans, elevations, sections, foundation, and service layouts.                     |
| 4.                       | To understand the integration of building services including electrical, drainage, furniture, and rainwater harvesting systems in building design. |
| 5.                       | To enhance free-hand sketching, drawing interpretation, and technical presentation skills.                                                         |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                  | <b>Bloom's Taxonomy Level</b> |
|------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Interpret and prepare architectural drawings including plan, section, and elevation of residential buildings.           | K3                            |
| 2          | Develop municipal drawings, center line plans, and foundation plans as per standard building practices                  | K3                            |
| 3          | Prepare furniture layouts, electrical/light layouts, and drainage layouts for residential buildings.                    | K3                            |
| 4          | Design and draft rainwater harvesting drawings for sustainable building planning.                                       | K3                            |
| 5          | Demonstrate free-hand sketching and technical drafting skills required for building planning and construction drawings. | K3                            |

| <b>List of Practical's</b>                                                                    |
|-----------------------------------------------------------------------------------------------|
| Term work shall consist of detailed report of in form of set of drawings mentioned below.     |
| 1. Architectural drawing (Plan, section & elevation of a building) apartment, row house etc.  |
| 2. Submission drawing using AUTOCAD                                                           |
| 3. Center line plan; 4. Foundation plan; 5. Furniture layout; 6. Electrical / lighting layout |
| 7. Drainage layout; 8. Rain water Harvesting Drawing.                                         |

|                    |                               |            |                 |                 |
|--------------------|-------------------------------|------------|-----------------|-----------------|
| <b>BTPESCE403L</b> | <b>Fluid Mechanics-II Lab</b> | <b>PCC</b> | <b>0L-0T-2P</b> | <b>1 Credit</b> |
|--------------------|-------------------------------|------------|-----------------|-----------------|

#### Course Objectives

|    |                                                                                                                                                      |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To understand the working principles and applications of different hydraulic valves, pipe fittings, turbines, and open channel flow systems.         |
| 2. | To develop practical knowledge of fluid flow behavior, energy losses, frictional resistance, and hydraulic phenomena.                                |
| 3. | To analyze hydraulic parameters such as head loss, coefficient of friction, velocity distribution, and channel constants using experimental methods. |
| 4. | To apply theoretical concepts of fluid mechanics and hydraulics in laboratory investigations and engineering practice.                               |
| 5. | To enhance experimental, analytical, and interpretation skills related to hydraulic engineering systems.                                             |

| <b>COs</b> | <b>Course Outcomes</b>                                                | <b>Bloom's Taxonomy Level</b> |
|------------|-----------------------------------------------------------------------|-------------------------------|
| 1          | Calculate friction factor major and minor losses in pipe.             | K2                            |
| 2          | Analyze the property of different types of valves and pipe fitting    | K3                            |
| 3          | To find the Force exerted by jet on the stationary and moving plates. | K3                            |
| 4          | Understand the working of turbine.                                    | K2                            |
| 5          | Study of Formation of Hydraulic jump and its parameters.              | K2                            |

#### List of Experiments

Experiment No 1: Demonstration of working of different types of valves and pipe fittings.  
Experiment No 2: Determination of loss of head due to Pipe Fittings  
Experiment No 3: Study of factors affecting coefficient of friction  
Experiment No 4: Impact of jet  
Experiment No 5: Study of turbine (Demonstration).  
Experiment No 6: Study of hydraulic jump  
Experiment No 7: Determination of Chezy's and Mannings constant  
Experiment No 8: Velocity distribution in open channel in transverse direction of flow.



|                    |                               |            |                 |                 |
|--------------------|-------------------------------|------------|-----------------|-----------------|
| <b>BTPESCE404L</b> | <b>Material Testing Lab-I</b> | <b>PCC</b> | <b>0L-0T-2P</b> | <b>1 Credit</b> |
|--------------------|-------------------------------|------------|-----------------|-----------------|

| <b>Course Objectives</b> |                                                                                                                                                   |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | Understand the physical and engineering properties of cement, fine aggregates, coarse aggregates, and concrete through standard laboratory tests. |
| 2.                       | Develop practical skills in conducting tests on construction materials according to relevant Indian Standards (IS codes).                         |
| 3.                       | Evaluate the quality, suitability, and performance characteristics of cement and aggregates used in concrete construction.                        |
| 4.                       | Analyze the behavior of fresh and hardened concrete through workability and strength assessment tests.                                            |
| 5.                       | Apply non-destructive and destructive testing methods for quality control and performance evaluation of concrete structures.                      |

| <b>COs</b> | <b>Course Outcomes</b>                                                                               | <b>Bloom's Taxonomy Level</b> |
|------------|------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Perform tests to determine the properties of cement.                                                 | K3                            |
| 2          | Evaluate the physical properties of fine and coarse aggregates.                                      | K4                            |
| 3          | Assess the strength characteristics of aggregates using standard tests.                              | K4                            |
| 4          | Determine the workability and compressive strength of concrete.                                      | K3                            |
| 5          | Evaluate the quality and strength of concrete using destructive and non-destructive testing methods. | K5                            |

| <b>List of Experiments</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Among following any twelve shall be performed</b></p> <ol style="list-style-type: none"> <li>1. Determine fineness of cement by sieving.</li> <li>2. Determine standard consistency, initial and final setting time of OPC.</li> <li>3. Determine compressive strength of OPC.</li> <li>4. Determine specific gravity of fine aggregate and coarse aggregate.</li> <li>5. Determine silt content in sand by volume.</li> <li>6. Determine bulking of sand.</li> <li>7. Determine bulk density of fine and coarse aggregates.</li> <li>8. Determine water absorption of fine and coarse aggregates.</li> <li>9. Determine fineness modulus of fine and coarse aggregates by sieve analysis.</li> <li>10. Determine aggregate impact value.</li> <li>11. Determine aggregate crushing value.</li> <li>12. Determine abrasion value of aggregate.</li> <li>13. Determine aggregate elongation index and flakiness index.</li> <li>14. Determine workability of concrete by slump cone test.</li> <li>15. Determine workability of concrete by compaction factor test.</li> <li>16. Determine compressive strength of concrete for 7 days and 28 days for different w/c ratios.</li> <li>17. Determine compressive strength of concrete by any one method of NDT.</li> </ol> |

|                 |                                                   |            |                 |                  |
|-----------------|---------------------------------------------------|------------|-----------------|------------------|
| <b>BTPEM02T</b> | <b>MDM-II: Building Construction and Planning</b> | <b>MDM</b> | <b>2L-0T-0P</b> | <b>2 Credits</b> |
|-----------------|---------------------------------------------------|------------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------|
| 1.                       | To introduce the basic components of building.                                         |
| 2.                       | To familiarize students with the principles of building planning, and building byelaws |
| 3.                       | To explain the basic building services.                                                |

| <b>COs</b> | <b>Course Outcomes</b>                                             | <b>Bloom's Taxonomy Level</b> |
|------------|--------------------------------------------------------------------|-------------------------------|
| 1          | Understand different types of structures, and building components. | K2                            |
| 2          | Apply principles of building planning and byelaws                  | K3                            |
| 3          | Use of different building services.                                | K3                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Hrs</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Building Construction:</b> Introduction types of buildings, components of buildings, design loads, Types of Structure, Types of Foundations, Masonry Construction: Stone masonry and Brick Masonry. Various types of Arches and Lintels, Doors and windows of different types, Staircase, Roofs and their types, various types of flooring, Plasters and Coloring, Damp proofing                                                                   | 10         |
| <b>Module II</b>  | <b>Building planning principles and Byelaws:</b> Principles of building planning orientation, sun diagram and wind diagram orientation of building in different climatic zones different types of buildings and planning considerations for apartment, bungalow, row-house and twin bungalow etc. Building Byelaws- open space, height, size of building, parking, garden, toilet , floor area ratio (F.A.R.), Builtup area, floor area, carpet area. | 10         |
| <b>Module III</b> | <b>Building Services:</b> Plumbing- water supply, sanitary fittings, systems of plumbing, drainage plans of buildings, septic tanks, Ventilation- natural and artificial, Air conditioning.                                                                                                                                                                                                                                                           | 10         |

| <b>Text Books:</b> |                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------|
| 1.                 | Punmia B.C., Jain A. K., 2008, "Building Construction", Laxmi Pub. Pvt. Ltd., 10th Edi, N. Delhi   |
| 2.                 | Arora S. P. and Bindra S. P., 2010, "Text Book of Building Construction", Dhanpat Rai Publications |
| 3.                 | Kumar Sushil, 2010, "Building Construction" Standard Publishers, 20th Edition.                     |
| 4.                 | P. Purushothama Raj, 2016, "Building Construction Materials and Techniques", Pearson Education     |
| 5.                 | Jain V.K., 2015, "Automation Systems in Smart and Green Buildings" ISBN NO: 978-81-7409-237-3      |

| <b>Reference Books:</b> |                                                                             |
|-------------------------|-----------------------------------------------------------------------------|
| 1.                      | Deodhar S.V., "Building Science and Planning", Khanna Publishers, N. Dehli, |
| 2.                      | SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi                 |
| 3.                      | I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings   |
| 4.                      | Jain A.K., "The Idea of Green Building" Khanna Publishers, N. Dehli,        |

  
 Page 40 of 50  
 APPROVED in...3<sup>rd</sup>.....  
 Academic Council Meeting  
 Dated :-...13/06/2026.....



|                  |                               |           |                 |                  |
|------------------|-------------------------------|-----------|-----------------|------------------|
| <b>BTPEOE31T</b> | <b>Introduction to MATLAB</b> | <b>OE</b> | <b>2L-0T-0P</b> | <b>2 Credits</b> |
|------------------|-------------------------------|-----------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                                                                        |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | Introduce the MATLAB environment and enable students to understand basic commands, variables, and arithmetic operations.                               |
| 2.                       | Develop the ability to create and manipulate vectors and matrices using MATLAB commands.                                                               |
| 3.                       | Enable students to perform mathematical operations on arrays and use built-in MATLAB functions for analysis and visualize data using various plotting. |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                                          | <b>Bloom's Taxonomy Level</b> |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Identify and explain MATLAB interface components, commands, variables, and arithmetic operations.                                               | K1/K2                         |
| 2          | Create and manipulate vectors and matrices using MATLAB commands and indexing techniques.                                                       | K3                            |
| 3          | Perform mathematical operations on arrays and analyze numerical data using built-in MATLAB functions and visualize data using various plotting. | K3/K4                         |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Hrs</b> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Starting with MATLAB:</b> Starting MATLAB, MATLAB Windows; Working in the Command Window; Arithmetic Operations with Scalars: Order Of Precedence, Using MATLAB as a Calculator; Display Formats; Elementary Math Built-In Functions; Defining Scalar Variables: The Assignment Operator, Rules about Variable Names, Predefined Variables and Keywords; Useful Commands for Managing Variables; Script Files: Notes about Script Files, Creating and Saving a Script File, Running (Executing) a Script File, Current Folder; Examples of MATLAB Applications<br><b>Creating Arrays:</b> Creating a One-Dimensional Array (Vector); Creating a Two-Dimensional Array (Matrix): The zeros, ones and, eye Commands; Notes about Variables in MATLAB; The Transpose Operator; Array Addressing: Vector, Matrix; Using a Colon: In Addressing Arrays; Adding Elements to Existing Variables; Deleting Elements; Built-In Functions for Handling Arrays; Strings and Strings as Variables | 10         |
| <b>Module II</b>  | <b>Mathematical Operations with Arrays:</b> Addition and Subtraction, Array Multiplication, Array Division, Element-By-Element Operations, Using Arrays in MATLAB Built-In Math Functions, Built-In Functions for Analyzing Arrays, Generation of Random Numbers, Examples of MATLAB Applications.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 08         |
| <b>Module III</b> | <b>Two-Dimensional Plots:</b> The plot Command: Plot of Given Data, Plot of a Function; The fplot Command; Plotting Multiple Graphs in The Same Plot: Using the plot Command, Using the hold on and hold off Commands, Using the line Command; Formatting a Plot: Formatting a Plot Using Commands, Formatting a Plot Using the Plot Editor; Plots with Logarithmic Axes; Plots With Error Bars; Plots With Special Graphics; Histograms; Polar Plots; Putting Multiple Plots On The Same Page; Multiple Figure Windows; Examples Of MATLAB Applications                                                                                                                                                                                                                                                                                                                                                                                                                                 | 12         |

**Text Books:**

|    |                                                                                                                                             |
|----|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Amos Gilat. (2011). MATLAB: An introduction with applications. Hoboken, NJ: John Wiley & Sons.                                              |
| 2. | Desmond J. Higham., & Nicholas J. Higham. (2016). MATLAB guide (3rd ed.). Philadelphia, PA: Society for Industrial and Applied Mathematics. |
| 3. | Steven C. Chapra. (2018). Applied numerical methods with MATLAB (4th ed.). New York, NY: McGraw-Hill Education.                             |
| 4. | Stormy Attaway. (2017). MATLAB: A practical introduction to programming and problem solving (4th ed.). Oxford, UK: Butterworth-Heinemann.   |

**Reference Books:**

|    |                                                                                                                                                                                                                                       |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Rudra Pratap. (2010). Getting started with MATLAB: A quick introduction for scientists and engineers. New Delhi, India: Oxford University Press.                                                                                      |
| 2. | Stephen J. Chapman. (2018). MATLAB programming for engineers (6th ed.). Boston, MA: Cengage Learning.                                                                                                                                 |
| 3. | Y. Kirani Singh., & B. B. Chaudhuri. (2013). MATLAB programming. New Delhi, India: PHI Learning Pvt. Ltd.                                                                                                                             |
| 4. | MATLAB beginner course: <a href="https://matlabacademy.mathworks.com/details/matlab-onramp/gettingstarted?utm_source=chatgpt.com">https://matlabacademy.mathworks.com/details/matlab-onramp/gettingstarted?utm_source=chatgpt.com</a> |



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|------------------|----------------------------------------------|-----------|-----------------|------------------|
| <b>BTPEOE23T</b> | <b>Smart Cities &amp; Urban Technologies</b> | <b>OE</b> | <b>2L-0T-0P</b> | <b>2 Credits</b> |
|------------------|----------------------------------------------|-----------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                                                                                                       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To introduce the fundamental concepts, dimensions, stakeholders, and sustainability principles of smart cities and urban development.                                                 |
| 2.                       | To develop understanding of smart city planning, governance, financing, infrastructure development, policies, and regulatory frameworks for sustainable urban management.             |
| 3.                       | To familiarize students with smart transportation, energy, communication technologies, and intelligent systems used in modern smart city applications through practical case studies. |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                                                                                 | <b>Bloom's Taxonomy Level</b> |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Explain the concepts, dimensions, stakeholders, sustainability principles, and performance benchmarks of smart cities.                                                                 | K2                            |
| 2          | Analyze smart city planning, urban infrastructure development, governance, financing mechanisms, regulations, and sustainable development policies.                                    | K4                            |
| 3          | Apply intelligent transportation systems, smart energy management, renewable energy integration, and wireless communication technologies in smart city solutions through case studies. | K3                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Hrs</b> |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Introduction to Smart cities</b><br>Introduction, Definition, dimensions, scope, Performance Benchmarks, Practice Code, Principal stakeholders, Concept of Sustainable cities                                                                                                                                                                                                                                                    | 08         |
| <b>Module II</b>  | <b>Smart Cities Planning and Development</b><br>Planning for Urban Infrastructure, key trends in smart cities developments, Sustainable features for smart cities. Planning for major infrastructure projects, Various Infrastructure Program and policies. Dimension of smart cities, Financing smart cities development, Governance of smart cities, Smart Cities Regulations & Smart Techniques.                                 | 12         |
| <b>Module III</b> | <b>Smart Transportation, Energy &amp; Communication Systems</b><br>Intelligent Transportation Systems (ITS), Smart Traffic Management and Parking Systems, GPS and Vehicle Tracking Systems, Smart Grid and Smart Energy Management, Renewable Energy Integration in Smart Cities, Smart Street Lighting Systems, Wireless Communication Technologies: Wi-Fi, ZigBee, LoRa, 5G, Machine-to-Machine (M2M) Communication. Case Study. | 10         |

| <b>Text Books:</b> |                                                                                   |
|--------------------|-----------------------------------------------------------------------------------|
| 1.                 | Introduction to smart cities by P.P. Anilkumar, Pearson Publication               |
| 2.                 | Smart cities and Urban Development in India by N. Mani , New Century Publications |

  
 Page 43 of 50  
 APPROVED in.....3<sup>rd</sup>.....  
 Academic Council Meeting  
 Dated :-.....13/06/2026.....

**Reference Books:**

|    |                                                                                                                                                                                                               |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia by Anthony M. Townsend.                                                                                                                 |
| 2. | GIS for Urban and Regional Planning" by Peter O'Connell.                                                                                                                                                      |
| 3. | Artificial Intelligence in the 21st Century" by Stephen Lucci and Danny Kopec                                                                                                                                 |
| 4. | Internet of Things for Smart Cities: Technologies, Big Data and Security by Zaigham Mahmood.                                                                                                                  |
| 5. | <a href="https://tomorrow.city/a/technology-for-smart-cities-the-pillars-of-urban-planning-of-the-future">https://tomorrow.city/a/technology-for-smart-cities-the-pillars-of-urban-planning-of-the-future</a> |
| 6. | <a href="https://www1.nyc.gov/assets/forward/documents/NYC-Smart-Equitable-City-Final.pdf">https://www1.nyc.gov/assets/forward/documents/NYC-Smart-Equitable-City-Final.pdf</a>                               |
| 7. | <a href="https://smartcity.go.kr/wp-content/uploads/2019/08/Smart-city-broschureENGLISH.pdf">https://smartcity.go.kr/wp-content/uploads/2019/08/Smart-city-broschureENGLISH.pdf</a>                           |

  
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Academic Council Meeting  
Dated :-.....13/06/2026.....



|                   |                                        |           |                 |                  |
|-------------------|----------------------------------------|-----------|-----------------|------------------|
| <b>BTPESOE24T</b> | <b>GIS &amp; Mapping for Beginners</b> | <b>OE</b> | <b>2L-0T-0P</b> | <b>2 Credits</b> |
|-------------------|----------------------------------------|-----------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                                                           |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To introduce students to the basic concepts, components, and applications of Geographic Information Systems (GIS) and mapping techniques. |
| 2.                       | To develop basic skills in handling spatial data, using GIS software, and preparing simple thematic maps.                                 |
| 3.                       | To enable students to perform basic spatial analysis and understand the practical applications of GIS in various fields.                  |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                                                  | <b>Bloom's Taxonomy Level</b> |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Students will be able to explain the fundamental concepts of GIS, mapping, spatial data, and map interpretation.                        | K2                            |
| 2          | Students will be able to use basic GIS tools and software to create, edit, and visualize simple geographic datasets and maps.           | K3                            |
| 3          | Students will be able to perform basic spatial analysis and identify the applications of GIS in solving real-world geographic problems. | K4                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Hrs</b> |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Introduction to GIS and Maps:</b> Meaning and definition of GIS; basic concepts of GIS; importance and uses of GIS; applications of GIS in daily life; components of GIS; introduction to maps; types of maps; elements of maps including scale, legend, symbols and direction; basics of cartography; spatial and non-spatial data; introduction to vector and raster data; point, line and polygon features; basics of coordinates, latitude and longitude; sources of GIS data; simple map reading and interpretation. | 10         |
| <b>Module II</b>  | <b>GIS Software and Data Collection:</b> Introduction to GIS software; overview of QGIS and ArcGIS; basic GIS tools and interface; methods of data collection; introduction to GPS; basics of remote sensing and satellite imagery; digitization and georeferencing; GIS data formats; creating and editing layers; attribute tables and simple database concepts; map symbolization, labeling and thematic map preparation.                                                                                                 | 10         |
| <b>Module III</b> | <b>Basic Spatial Analysis and GIS Applications:</b> Introduction to spatial analysis; simple attribute and spatial queries; basics of buffer and overlay analysis; introduction to raster analysis; basics of Web GIS and mobile GIS; applications of GIS in agriculture, urban planning, environment and disaster management; ethical use of GIS data; preparation of simple thematic maps; basic GIS project and presentation.                                                                                             | 10         |

| <b>Text Books:</b> |                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1.                 | Chang, K. (2016). Introduction to Geographic Information Systems. McGraw-Hill Education, New York.                                      |
| 2.                 | Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). Geographic Information Systems and Science. Wiley, Chichester. |
| 3.                 | Bolstad, P. (2016). GIS Fundamentals: A First Text on Geographic Information Systems. XanEdu Publishing, Ann Arbor.                     |

|    |                                                                                                                              |
|----|------------------------------------------------------------------------------------------------------------------------------|
| 4. | DeMers, M. N. (2009). Fundamentals of Geographic Information Systems. Wiley, New York.                                       |
| 5. | Burrough, P. A., & McDonnell, R. A. (1998). Principles of Geographical Information Systems. Oxford University Press, Oxford. |

**Reference Books:**

|    |                                                                                                                                                     |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Burrough, P. A., McDonnell, R. A., & Lloyd, C. D. (2015). Principles of Geographical Information Systems. Oxford University Press India, New Delhi. |
| 2. | Pandey, J., & Pathak, D. (2015). Geographic Information System. TERI Press, New Delhi.                                                              |
| 3. | Chakraborty, D., & Sahoo, R. N. (2020). Fundamentals of Geographic Information System. Viva Books, New Delhi.                                       |
| 4. | Heywood, I., Cornelius, S., & Carver, S. (2011). An Introduction to Geographical Information Systems. Pearson Education India, New Delhi.           |



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|--------------------|----------------------------------------------------|-------------|-----------------|------------------|
| <b>BTPESCE406T</b> | <b>Software Application in Civil Engineering-I</b> | <b>VSEC</b> | <b>0L-0T-2P</b> | <b>2 Credits</b> |
|--------------------|----------------------------------------------------|-------------|-----------------|------------------|

#### Course Objectives

|    |                                                                                                                                                                            |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | To introduce students to commonly used civil engineering software tools such as spreadsheet applications, AutoCAD, EPANET, QGIS, and SWMM for engineering problem solving. |
| 2. | To develop the ability to organize, analyze, and interpret civil engineering data using spreadsheet software for calculations and graphical representation.                |
| 3. | To enable students to prepare technical drawings and layouts using computer-aided design tools such as AutoCAD.                                                            |
| 4. | To provide practical knowledge in modeling and analysis of water distribution and drainage systems using EPANET and SWMM software.                                         |
| 5. | To develop basic skills in spatial data handling and mapping techniques using QGIS for civil engineering applications.                                                     |

| COs | Course Outcomes                                                                                                                         | Bloom's Taxonomy Level |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 1   | Explain the basic functions and applications of civil engineering software tools such as Spreadsheets, AutoCAD, EPANET, QGIS, and SWMM. | K2                     |
| 2   | Use spreadsheet software to perform engineering calculations, data analysis, and graphical representation.                              | K3                     |
| 3   | Prepare and interpret civil engineering drawings using AutoCAD for basic structural and architectural layouts.                          | K3                     |
| 4   | Analyze water distribution and stormwater systems using EPANET and SWMM software.                                                       | K4                     |
| 5   | Apply GIS techniques using QGIS for mapping, spatial data handling, and civil engineering problem solving.                              | K3                     |

#### List of Experiments

**Among following any Three groups shall be performed**

##### Group A: Spreadsheet (Excel / Similar Software)

1. Basic spreadsheet operations including data entry, formatting, use of arithmetic formulas, and application of engineering units.
2. Application of statistical functions such as mean, median, standard deviation, and creation of graphs for civil engineering datasets like rainfall, discharge, and material properties.
3. Preparation of engineering sheets such as beam load calculations, quantity estimation, or simple design calculations using formulas and cell referencing.

##### Group B: AutoCAD

1. Introduction to AutoCAD interface, basic drawing commands, and creation of simple geometric shapes and engineering symbols.
2. Preparation of building layout plans including walls, doors, windows, and dimensioning using standard CAD tools.
3. Drawing of structural elements such as beams, columns, and foundation layouts with proper scaling and annotation.

**Group C: EPANET**

1. Introduction to EPANET interface, creation of simple water distribution network with nodes, pipes, reservoirs, and tanks.
2. Hydraulic simulation of pipe networks including calculation of pressure, flow rate, and head loss.
3. Analysis of water distribution system under different demand conditions and interpretation of results.

**Group D: QGIS**

1. Introduction to QGIS interface, loading spatial data, and basic map navigation.
2. Creation of vector layers including point, line, and polygon features for civil engineering applications like roads, buildings, and utilities.
3. Thematic mapping and spatial analysis such as buffer analysis for roads, schools, and water pipelines.

**Group E: SWMM (Storm Water Management Model)**

1. Introduction to SWMM interface and creation of a basic urban drainage system model.
2. Simulation of rainfall-runoff process and analysis of surface runoff and flow in drainage networks.
3. Design and analysis of stormwater drainage systems including pipe sizing and flood estimation under different rainfall events.

**Text Books:**

|    |                                                                                                                                                                 |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Sarma, T. S., STAAD.Pro V8i for Beginners with Indian Examples, Notion Press, Chennai. (For structural analysis and modeling using STAAD.Pro based on IS codes) |
| 2. | Subramanya, K., Hydrology and Water Resources Engineering, McGraw Hill Education (India), New Delhi. (For hydraulic concepts used in HEC-RAS)                   |
| 3. | Chitale, M. V., Civil Engineering Software Applications, Technical Publications, Pune. (Integrated use of multiple civil engineering software tools)            |

**Reference Books:**

|    |                                                                                                                                                                                      |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Bhattacharya, A. B., Mastering AutoCAD for Civil Engineering, S. Chand Publishing, New Delhi. (For 2D drafting, building drawings, and civil engineering applications using AutoCAD) |
| 2. | Karve, S. R., Shah, S. S., ETABS Made Easy for Structural Design, Technical Publications, Pune. (For building analysis and design using ETABS)                                       |
| 3. | Modi, P. N., Water Supply Engineering, Standard Book House, New Delhi. (For water distribution concepts used in EPANET)                                                              |
| 4. | Kumar, S., Geographic Information System (GIS): Principles and Applications, B.S. Publications, Hyderabad. (For spatial analysis using QGIS)                                         |
| 5. | Sharma, R. K., Urban Hydrology and Storm Water Management, S. Chand Publishing, New Delhi. (For stormwater modeling using SWMM)                                                      |



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| <b>BTPESCOIT</b> | <b>Constitution of India</b> | <b>HSSM-VEC</b> | <b>1L-0T-0P</b> | <b>1 Credits</b> |
|------------------|------------------------------|-----------------|-----------------|------------------|

| <b>Course Objectives</b> |                                                                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.                       | To familiarize the students with the legacy of India's constitutional development and assist them in comprehending the country's most varied legal text and its underlying philosophy. |
| 2.                       | To educate students about the Indian Parliamentary System's theoretical and practical features.                                                                                        |

| <b>COs</b> | <b>Course Outcomes</b>                                                                                       | <b>Bloom's Taxonomy Level</b> |
|------------|--------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1          | Establish and explore the fundamental aspects and procedures of the Indian constitution.                     | K2                            |
| 2          | Compare and relate the operation of India's parliamentary system at the national and state levels.           | K2                            |
| 3          | Learn about and implement the various laws and rules pertaining to engineering procedures relevant with IPR. | K2                            |

| <b>Module</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Hrs</b> |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module I</b>   | <b>Introduction and Basic Information about Indian Constitution.</b><br>Constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act-1935 and Indian Independence Act-1947, Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government | 05         |
| <b>Module II</b>  | <b>Union Executive and State Executive: .</b><br>Powers of Indian Parliament, Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, LokAyukta, The Lokpal and Lokayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts                                 | 05         |
| <b>Module III</b> | <b>Intellectual Property Laws and Regulation to Information:</b><br>Intellectual Property Laws- Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information- Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.                                                                                                     | 05         |

**Text Books:**

|    |                                                                                                                  |
|----|------------------------------------------------------------------------------------------------------------------|
| 1. | Brij Kishore Sharma: Introduction to the Indian Constitution, PHI, New Delhi, latest edition                     |
| 2. | Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018. |
| 3. | P M Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.                                 |
| 4. | V. K. Ahuja: Law Relating to Intellectual Property Rights (2007)                                                 |
| 5. | P. Narayan: Intellectual Property Law, Eastern Law House, New Delhi                                              |

**Reference Books:**

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|----|----------------------------------------------------------------------------------------------------|
| 1. | Granville Austin: The Indian Constitution: Corner stone of a Nation. 1966, Oxford Clarendon Press. |
|----|----------------------------------------------------------------------------------------------------|



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