MAHAMAYA TECHNICAL UNIVERSITY, NOIDA

Syllabus

For

B. TECH. SECOND YEAR

Of

CIVIL ENGINEERING(CE)

(Effective from the Session: 2013-14)
<table>
<thead>
<tr>
<th>S. No</th>
<th>Code</th>
<th>Subjects</th>
<th>Periods</th>
<th>Evaluation Scheme</th>
<th>Total</th>
<th>Credit</th>
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<tr>
<td>1</td>
<td>HU-301/AS-306</td>
<td>Human Behaviour (Including Human Sociology and Psychology)/Technical Writing</td>
<td>3 0 0</td>
<td>10 10 20 -</td>
<td>80 -</td>
<td>100 3</td>
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<tr>
<td>2</td>
<td>AS-301B</td>
<td>Engineering Mathematics-III</td>
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<td>3</td>
<td>EE-305/CE-304</td>
<td>Sensor and Instrumentation/Building Material Construction</td>
<td>3 1 2</td>
<td>20 10 30 15</td>
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<tr>
<td>4</td>
<td>CE-301</td>
<td>Fluid Mechanics</td>
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<td>20 10 30 15</td>
<td>100 30</td>
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<tr>
<td>5</td>
<td>CE-302</td>
<td>Mechanics of Solids</td>
<td>3 1 2</td>
<td>20 10 30 15</td>
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<td>175 5</td>
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<tr>
<td>6</td>
<td>CE-303</td>
<td>Surveying</td>
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<td>20 10 30 15</td>
<td>100 30</td>
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<tr>
<td>7</td>
<td>AU-301/AU-401</td>
<td>Human Values and Professional Ethics</td>
<td>2 1 0</td>
<td>10 10 20 -</td>
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<tr>
<td>8</td>
<td></td>
<td>General Proficiency</td>
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<td>1000 27</td>
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</tbody>
</table>

L: Lecture  T: Tutorial  P: Practical/Project  CT: Class Test  TA: Teacher’s Assessment  Th: Theory  TOT: Total  

TA = 10  (5 for teachers assessment plus 5 for attendance)  
TA = 20  (10 for teachers assessment plus 10 for attendance)  
P = 15  (4marks for practical exam. 4marks viva. 4marks for lab. records and 3 marks for quiz)  
P = 30  (10marks for practical exam. 10marks viva. 5marks for lab. records and 5 marks for quiz)  

Note: AU-301/AU-401 may be offered in both the Semesters. A student has to clear this subjects in second year or in any semester after second year.
<table>
<thead>
<tr>
<th>S. No</th>
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<th>Subjects</th>
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<td>CT</td>
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<td>Psychology)</td>
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<tr>
<td>2</td>
<td>AS-402</td>
<td>Basics of system Modelling &amp; Simulation</td>
<td>3</td>
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<td>3</td>
<td>CE-401</td>
<td>Structural Analysis - I</td>
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<td>CE-403</td>
<td>Hydraulics and Hydraulic Machines</td>
<td>3</td>
<td>1</td>
<td>2</td>
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<tr>
<td>6</td>
<td>CE-404/</td>
<td>Building Material Construction/ Sensor and Instrumentation</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>20</td>
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<td></td>
<td>EE-405</td>
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<td>7</td>
<td>AU-401</td>
<td>Human Values and Professional Ethics</td>
<td>2</td>
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L: Lecture    T: Tutorial   P: Practical/Project   CT: Class Test   TA: Teacher's Assessment
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TA = 10 (5 for teachers assessment plus 5 for attendance)

TA = 20 (10 for teachers assessment plus 10 for attendance)

P = 15 (4 marks for practical exam. 4 marks viva. 4 marks for lab. records and 3 marks for quiz)

P = 30 (10 marks for practical exam. 10 marks viva. 5 marks for lab. records and 5 marks for quiz).
Objective of the Course: The course intends to impart knowledge and learning of different aspects of human behaviour especially in the organisational context that directs human behaviour. This has special significance to the professionals as these aspects of human behaviour needs to be accounted for while taking a decision with respect to enhancement of human productivity.

UNIT-I

UNIT-II

UNIT -III
Motivation: Meaning, Maslow’s, Herzberg, McClelland’s Theories of Motivation, Leadership: Style and Theories of Leadership-Trait, Behavioural and Situational Theories, Conflict Management: Conflict: Concept, Sources, Types, Classification of Conflict Intra, Individual, Interpersonal, Intergroup and Organisational, Resolution of Conflict.

UNIT -IV
Group Dynamics: Types of Group and their development stages, concept, status, norms size and cohesiveness. Power and Politics: Concept, Sources of Power, Distinction between Power, Authority and Influence, Approaches to Power, Political Implications of Power: Dysfunctional Uses of Power.

References:
1. Newstrom John W. - Organizational Behaviour: Human Behaviour at Work (Tata Mc Graw Hill,
2. Luthans Fred - Organizational Behaviour (Tata Mc Graw Hill, 10th edition)
4. Robbins Stephen P. - Organizational Behaviour (Pearson Education)
5. Hersey Paul, Blanchard, Kenneth H and Johnson Dewey E. - Management of Organisational Behaviour:


8. Ian Brooks : Organizational Behaviour, Pearson Learning


Objective of The Course

To impart basic skills in Technical Communication in various formats of technical writing to MCA and second year UG students in the English language. Having achieved the basic skills in professional communication in English through laboratory practice teaching, the students are required to learn various forms of technical writings. Communication is not restricted to forms of verbal interaction among the professionals. Every professional is required to be proficient in Technical Communication as well. Such proficiency is desired to be achieved through class room learning of different formats of technical writing which are usually used in any technical profession.

Desired Outcome of The Course

The students must be able to:

(a) Understand Communication as a process and channels of it in general and Technical Communication in particular.
(b) Learn Technical writing including sentence structure and be able to understand and use technology specific words.
(c) Write scientific articles, synopsis, reports (routine and annual) including Project and Sample Reports.
(d) Write Technical Notes, Proposals and Articles.
(e) Learn to records minutes of meetings, Seminars, workshops, make technical presentations and learn resume/CV writing.

Key Concepts
Communication as a process of interaction between originator and receiver.
Context of Technical Communication as means of indulgence in various forms and formats of technical writings as required in organizations-technological as well as commercial.

Writing Skills: Selection of words and phrases in technical writing leading to sentence structure as well as length and structure of paragraph. Writing scientific Articles, Reports, recording minutes and Notes, authoring and review of Research Articles.

Speaking Skills: Participation in Meetings, Seminars, Workshops and Technical Presentation.

Teaching Methodology
1. Equipping the student for competent techno-specific Technical Communication in English Language and enabling the student to be proficient in technical writing.
2. The teacher is required to teach the course through lectures, tutorials and samples of written technical formats.
3. The teacher must project himself as a proficient expert in technical writing of English language.
4. The course has to be taught in small batches so as to give individual attention to students – both, in the process of learning to write as well as participation in conferences, seminars, workshops and project presentations.
5. The Books suggested have portions of Technical Communication in each and as such the same be treated as base texts. Expansion of the parts be undertaken with the help of relevant matter through internet. Infact, the students be encouraged to enhance their technical writing skills by self learning.

Unit - I
Communication–Nature and process.
Channels of Communication–Down ward, upward and horizontal Communication.
Networks and Barriers to Communication.
Importance and Need for Technical Communication
Nature of Technical Communication-Aspects and Forms of Technical Communication
Technical Communication Skills—Listening, Speaking, Reading and Writing (Improving these with comprehensions).

**Unit-II**

Techniques of Writing, Selection of words and phrases in technical writing.
Difference between Technical Writing and General Writing.
Abstract and specific words
Sentence structure, Requisites of sentence construction.
Paragraph Length and structure
Jargons and Cliché.

**Unit-III**

Scientific Article Writing.
Synopsis Writing, Project writing and Dissertation /Thesis Writing.
**Report Writing**—meaning, significance, structure and style.
Different type of Reports—routine reports and annual reports.
Project Reports
Sample Reports
**Technical Articles**—nature, significance and types.
Journal Articles and Conference Papers.

**Unit-IV**

Technical Note Making
Mechanics and Note Writing Techniques.
Technical Proposals—meaning, structure, types and significance.
Types of Proposals
Review and Research Articles.
Elements of Technical Articles.

**Unit-V**

**Meetings**—Preparation of Agenda, participation, chairing and writing minutes of meetings.
Conferences, Seminars, Technical Presentations and Workshops.
Video Conferencing, technical description of engineering objects/produces and processes.
Slogan Writing, Speech advertising.
CV Writing, difference between Biodata, CV and Resume. Types of resume and tips for resume writing.

Text Books & References


Performance & Evaluation System

The students shall write two internal sessional tests as for other subjects besides the end-semester written exams. The internal sessionals will have a weightage of 20 marks and the end-semester theory examination shall carry 80 marks making the subject of Technical Writing worth 100 marks.

Assignments are to be given to reinforce the concepts and ensure total understanding of technical writing.
Suggested web-links:

http://www.ego4u.com/
http://www.english4today.com/
http://www.learnamericanenglishonline.com/
http://learnenglish.britishcouncil.org/en/
http://www.englisch-hilfen.de/en/
http://www.englishclub.com/
http://www.englishlearning.com/
http://learningenglish.voanews.com/
http://www.usingenglish.com/dictionary.html
1. **Title of the course:** ENGINEERING MATHEMATICS-III (AS-301B)

2. **Work load per week**
   a. Lecture (L): 3 hrs/week  
      Total Lecture Hours per Semester: 42
   b. Tutorials (T): 1 hrs/week  
      Total Tutorial Hours per Semester: 12+12
   c. **Total Credits:** L+T+P  
      4

   d. One credit is defined as one lecture load per week and two hours of self-study to be connected with tutorial and assignments.

3. **Prerequisites of the course:** Engineering Mathematics I & II.

4. **Why you need to study this course:**
   Engineering Mathematics is one of the important tools of engineering. It is essential for an engineering student to know the mathematical terminology, concept and methods used in various engineering disciplines.

**Course Objective:**
Basic idea of the course will be to introduce the concept of Complex analysis, Mathematical Methods (Fourier analysis, Z-transform and Difference equations), Mathematical Statistics, Numerical Techniques I and II.

5. **Learning outcomes expected from the course:**
   At the completion of this Course, student will have the basic skills required to:
   a. Understand the concept of Complex analysis including complex integration and conformal mapping which are useful to all branches of engineering.
   b. The concept of Mathematical Methods helps the students to understand various transforms which are useful all branches of engineering.
   c. The concept of Mathematical statistics will enable the students to understand models of probability distribution to be tested by statistical methods.
   d. Numerical Methods enable students to evaluation of definite integrals, the solution of equations and linear systems, the solution of differential equations etc.

**Unit-I: Complex Analysis**
Analytic functions, Cauchy-Riemann equations. Conformal mapping (for linear transformation). Cauchy’s theorem, Cauchy integral formula. Power Series, Taylor series, Laurent series. Zeros, Singularities, Poles. Residue theorem, Evaluation of real integrals of the type \[ \int_0^{2\pi} f(\cos x, \sin x)dx \] and \[ \int_{-\infty}^{\infty} f(x) \, dx. \]

**Unit-II: Mathematical Methods**

**Unit-III: Mathematical Statistics**

**Unit-IV: Numerical Techniques – I**
Solution of Algebraic and Transcendental equations, Regula-Falsi method, Newton-Raphson method, Rate of convergence. Solution of liner simultaneous equations: Crout’s method, Gauss-Seidel method. Interpolation, finite differences, difference tables, relations between operators, Newton’s forward/backward difference formulae, Newton’s divided difference formula, Gauss’s Central difference formula. Cubic Spline method.
Unit-V: Numerical Techniques – II

Numerical Differentiation and Numerical integration, Newton Cote’s quadrature formula, Trapezoidal rule, Simpson’s $1/3^{rd}$ & $3/8^{th}$ rules. Numerical solutions of ordinary differential equations, Picard’s method, Euler’s & Euler’s modified methods, Runge-Kutta $2^{nd}$ and $4^{th}$ order methods, Milne’s Predictor-corrector Method.

Text Books:

Reference Books:
Objective & Outcome of learning

This is intended to be a compulsory course for all branches of Engg. The objective of the course is to familiarize with different types of main sensors and transducers used in industry and to familiarize how signal conditioning is to be carried out for further use. Then how to acquire this data for computer and to telemeter it over a distance. Some basic fundamental of virtual instrumentation system and display devices is stressed. This course enables the students to learn the sensors and transducers & their application course in industry.

Pre-requisite: Basic courses of Electrical and Electronics Engg: EE-101/EC-101

Unit-I

Unit-II
Signals Definition, Analog Signal Processing Circuits: Bridges, Op-amp Amplifiers, Differential Amplifiers, Active Filters(Low Pass & High Pass), Frequency to Voltage Convertor, Voltage to Frequency Convertor, Modulator (AM), & Demodulator (Envelop Detector).

Unit-III

Unit-IV
Virtual Instrumentation
Instrumentation System for Flow, Pressure, and Temperature Measurement
Measurement Errors: Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures.

UNIT- V : Data Transmission and Telemetry

Text Books:
1. DVS Murthy “Transducers and Instrumentation, PHI 2nd Edition 2013
3. Ranjan CS (et.al) “Instrumentation and Device Systems” PHI.

Reference Books:
Lab.EE-305P/EE-405P

Minimum of nine experiments from the following:

2. Study of LVDT sensor
4. Frequency measurement of supply voltage
5. Study of Ultrasonic Flow Sensor
6. Study of ADC & DAC
7. Study of Proximity Sensors.
8. Acquisition of various sensors Output using USB DAQ.
Building Material & Construction

1. **Title of the Course** : CE-304/CE-404: Building Material & Construction

2. **Work Load**:
   a. Lecture (L): 3 hours/Week  
      Total lecture hours per semester: 42
   b. Tutorial (T): 1 hour/Week  
      Total tutorial hours per semester: 14
   c. Practicals (P): 2 hours/Week  
      Total lab hours per semester: 28
   d. Total credits: L+T+P = 5

1. **Prerequisites of the Course** : CE-103/CE203 : Geological Sciences.

2. **Prerequisites for next course**:
   - Design of concrete structures.
   - Design, construction and maintenance of roads, rails, highways and airways in Transportation Engineering.
   - Design and construction of bridges in Bridge Engineering.
   - Design, construction and maintenance of dams, reservoirs, drains and canal in Hydraulic Engineering.

3. **Why you need to study this Course**:
   Building material and construction is very wide and important subject for Civil Engineering. The subject makes you to give a wide knowledge of civil engineering construction materials, their behavior, strength and their specific use. The subject gives the knowledge for procurement and production of construction material such as stones, bricks, gypsum, pozzolona, timber, asphalt, bitumen and tar. The subject also gives the chemical and mechanical properties of plastic, paints, varnishes, distemper, ferrous and aluminum metal; ingredients of glass and its use etc. It also gives the knowledge for construction principles, methods for layout of different types of structures at different sites of construction.

4. **Course Objective**:
   - To understand the characteristics of building construction material such as stones, bricks, gypsum, lime, puzzolona, timber, asphalt, bitmen and tar etc.
   - To understand the production of bricks, puzzolona, timber, wood based products.
   - To understand the chemical and mechanical properties of stones, bricks, plastic, glass wood, ferrous metals, paints, varnishes and distemper etc.
   - To understand the method of fixing layout of civil engineering structures at site.
   - To know different type of floors, slabs, trusses and other framed structures.
   - To understand the type and use of doors, windows, ventilators, ducts, stair, escalators, etc.
   - To know about materials used in water supply sanitary fittings (plumbing), electric supply, heating and air conditioning, fire fighting, acoustics in the buildings etc.

5. **Learning outcomes expected from the Course**: After the completion of this course, student will have basic skills required to:
   a) Selecting the type of construction materials for his construction work.
   b) Selecting type of steel, or any other metal for the strength of slabs, columns and foundation etc.
   c) Will be able to save the structure from harmful insects and ants etc.
d) Will be able to select type of floor and floor materials for a particular structure.
e) Will be able to give the layout of structure under construction.

6. **Aims:** This course will provide a fair knowledge to the students about –

- Knowledge of different types of materials which are used in civil engineering construction works.
- Knowledge, use and chemical compositions of paints, varnish, distemper etc.
- Knowledge of different types of floor and roof etc.
- Saving the structure from insects and ants by different insecticides etc.
- Saving the structure by rain water and water seepage from different sources.

9. **Details of Syllabus of the Course:**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text book, Ref No. - Chapters</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>Introduction about the subject. Classification of materials, materials and their performance, economics of the building materials</td>
<td>1 1</td>
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<tr>
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<td>Stones, requirement of good building stone, characteristics of stones and their testing. Common building stones. Preservation of stones</td>
<td>1 1,3</td>
<td>2</td>
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<tr>
<td></td>
<td>Bricks: manufacture of clay bricks and their classification</td>
<td>1 2</td>
<td>1</td>
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<tr>
<td></td>
<td>Properties of clay bricks and their testing. Problem of efflorescence and lime bursting in bricks and tiles</td>
<td>1 2</td>
<td>2</td>
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<tr>
<td></td>
<td>Gypsum: properties of gypsum plaster, building products of gypsum and their uses</td>
<td>1 19</td>
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<td>Lime: manufacture of lime, classification of limes, properties of lime</td>
<td>1 2</td>
<td>1</td>
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<td></td>
<td>Pozzolona: Natural and artificial flyash, surkhi (burnt clay puzzolona), rice husk and ash puzzolona, properties and specification for use in construction</td>
<td>1 9</td>
<td>1</td>
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<td>Timber: classification and identification of timber, fundamental engineering properties, defects in timber, factor affecting strength of timber, seasoning and preservation of timber, wood based products.</td>
<td>1 4</td>
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<tr>
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<td>Ashphalt, Bitumen and Tar: terminology, specifications and uses, Bituminous materials.</td>
<td>1 16,17</td>
<td>1</td>
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<tr>
<td>Unit-II</td>
<td>Chemistry of plastic manufacturing process, classification, advantages of plastics, mechanical properties and their use in construction.</td>
<td>1 16</td>
<td>2</td>
</tr>
</tbody>
</table>
1. Correlate the crushing value of a given aggregate with its Impact value?
2. Determine the strength of a cement using Le-chatalies's apparatus?
3. Determine the tensile strength of a given cement through Vicat's apparatus.
4. Determine the compression strength of cubes of a cement concrete, having size of 150x150x150 mm and of 75x75x75 mm.
5. How the compression strength and allowable stress are correlated for a cement concrete mix cubes of different sizes.
6. Determine the moisture absorption of given bricks and discuss its influence on compressive strength of bricks.
7. How will you compare the compressive strength of I, II, III class brick available in the market? How will you establish whether a given brick is I, II or III class?
8. How will you determine the dimension tolerances of brick?
9. How will you determine the efflorescence of I, II & III class brick?

11. Text Books:

12. Reference Books:
1. P C Varghese: Building Materials, PHI.
2. P C Varghese: Building construction, PHI.

13. Evaluation methodology to be followed:
The evaluation and assessment plan consists of the following components:
   a. Class attendance and participation in class discussion etc.
   b. Quizzes
   c. Home-works and assignments
   d. Sessional Examinations
   e. Final Examination

14. Award Classification:
Assessment procedure will be as follows:

   • Class attendance and participation in discussions will be based on:
     a. Substantial in-class contribution about class topics and discussion question.
     b. Response to other students queries
     c. Contribution in discussion and chat sessions
   • Quizzes
     a. Quizzes will be of type multiple choices, fill in the blanks or match the columns.
     b. Quizzes will be held periodically
   • Home works and assignments
     a. The assignment/home – works may be of multiple choice type or comprehensive type.
b. They will be available online but submission will be carried out in handwritten form.

c. The grades and detailed solutions of assignment (of both types) will be accessible online after the submission deadline.

- Projects
  a. Will be assigned in the mid part of the course and should be completed and submitted before the end of the course.
  b. The presentation and grading will be available online.

- Sessional and Final Examinations
  These will be comprehensive examinations held on-campus (Sessionals) or off-Campus (External) on dates fixed by the University.
**Fluid Mechanics**

1. **Title of the Course**: CE-301 : Fluid Mechanics

2. **Work Load**
   a. Lecture (L): 3 hours/Week  
      Total lecture hours per semester: 42
   b. Tutorial (T): 1 hour/Week  
      Total tutorial hours per semester: 14
   c. Practicals (P): 2 hours/Week  
      Total lab hours per semester: 28
   d. Total credits: L+T+P = 5

   *One credit is defined as one lecture load per week and 2 hours of self study to be counted with tutorials.

3. **Prerequisites of the course: Basic knowledge of Ist year physics & Mathematics

4. **Prerequisites for which next course**: The course is prerequisite for
   - Hydraulics and Hydraulic Machines
   - Engineering Hydrology
   - Advance open channel flow
   - Analysis and design of Hydraulic Structures
   - River Engineering
   - Water resources Engineering
   - Hydraulics Machine
   - Water power Engineering
   - Environmental Engineering (Water supply and sanitary Engineering)
   - Transport phenomenon

5. **Why you need to study this course**: Fluid mechanics is an important course for Civil, Mechanical and Chemical Engineering. It makes you understand about the nature and flow of fluid (especially water) in close and open conduits. It lays foundation for advanced courses. The various processes in River Engineering, Canal design, Dam design, Water supply & Sanitary engineering presently named as Environmental Engineering, Hydraulics Machines, Water-Power, Transport phenomena cannot be understood and design cannot be carried out properly without adequate knowledge of Fluid Mechanics.

6. **Course objective**:
   - To understand the basic nature of fluid, pressure exerted by it.
   - To understand the type of fluid flows, continuity equation, stream lines, stream function and concept of source & sink.
   - To understand the equation of motion, energy equation and momentum equation and application for velocity measurements.
   - To understand dimensional numbers and similarities for model analysis.
   - To understand the concepts and nature of laminar flow and turbulent flow.
   - To understand the design of pipe flow problems.
   - To understand the effect of boundary layer, drag and lift.

7. **Learning outcomes expected from the course**:
   At the completion of course, student will have the basic skills required to:
   a) Analyze fluid flow problems
   b) Apply equation of continuity of mass, energy equation and momentum equation for any analysis
   c) To carry out hydraulic model analysis of a given hydraulic structure
   d) To carry out design of pipe flow in various situation and aerodynamic objects

8. **Aims**:
   This course will provide a fair knowledge to the students
   - To deal with fluid flow problems in various situations
• To understand and appreciate the application of mass, momentum and energy equation
• To understand and distinguish between laminar flow and turbulent flows and mechanism of boundary layer flow for analysis of aerodynamic objects
• To be able to analyze the pipe flow problems in a water distribution units or for any type of fluid

9. (a) Details of Syllabi of the course

<table>
<thead>
<tr>
<th>UNIT</th>
<th>TOPIC</th>
<th>TEXT BOOK Ref:1 CHAPTER</th>
<th>LECTURES</th>
</tr>
</thead>
</table>
| 1    | Fluid continuum, physical properties, Newtonian and Non-Newtonian fluids  
• Pressure-density-height relations  
• Manometers  
• Pressure transducers  
• Pressure on plane and curved surfaces  
• Center of pressure  
• Buoyancy, stability of immersed and floating bodies  
• Fluid masses subjected to linear acceleration  
• Fluid masses subjected to uniform rotation | 1  
1  
2  
3  
4  
5  
5 | 1  
1  
2  
1  
1  
1 |
| 2    | Types of fluid flow: Continuum & free flow, steady flow, unsteady flow, laminar and turbulent flow, uniform and non-uniform flow  
• Compressible, Incompressible flows, Subsonic, Sonic & Supersonic flows, Subcritical, critical and Supercritical flows over two and three dimensional flow  
• Streamlines, Continuity equation for 3D & 1D flows  
• Circulation, stream function and velocity potential  
• Source, Sink, doublet & half body | 1  
5  
5  
6  
6  
6  
19  
10  
8  
17  
17  
7  
7  
19  
10  
8  
17 | 1  
1  
2  
2  
1  
1  
1  
2  
1  
1  |
| 3    | Equation of motion along a streamline  
• Bernoulli’s equation and its application, Pitot tube, orifice meter, Venturimeter and bend meter  
• Hot wire anemometer & LDA  
• Notches and weirs  
• Momentum equation and application to pipe bends  
• Dimensional analysis, Buckingham’s pi theorem  
• Important dimensional numbers  
• Similarities and model studies | 7  
7  
19  
10  
8  
17  
17  
13  
13  
11  
11  | 1  
2  
1  
2  
1  
1 |
| 4    | Equation of motion for laminar flow, through pipes  
• Stoke’s law  
• Transition from laminar to turbulent flow, isotropic, homogeneous, turbulence scale and intensity of turbulence, measurements.  
• Eddy viscosity, mixing length concept and velocity distribution in turbulent flow over a smooth and rough surfaces.  
• Resistance to flow, minor loses.  
• Pipes in series and parallel. | 13  
13  
11  
11  | 2  
1  
1  
1  
1  |
Lab. CE-301P

1. To verify Bernoulli’s theorem
2. To verify the momentum equation using the experimental set-up on impact of jet.
3. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
4. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
5. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
6. To study the variation of friction factor, ‘f’ for turbulent flow in commercial pipes.
7. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
8. Verification of metacentric height.

10 (a) Text Books:

10 (b) References:
1. S. Narshiman: First course in Fluid Mechanics, University Press
8. Ojha.,” Fluid Mechanics & Turbo Machines, Oxford University Press
11. Evaluation methodology to be followed

The evaluation and assessment plan consist of the following components:

a. Class attendance and participation in class discussion in lecture and practicals etc.
b. Quizzes for lecture and practicals
c. Home-works and assignments
d. Projects
e. Sectional examinations
f. Final examination

12. Award classification

Assessment procedure will be as follows:

- Class attendance and participation in discussion will be based on:
  a. Substantial in-class contribution about class topics and discussion questions
  b. Response to other students’ queries
  c. Contribution in discussion and chat sessions
- Quizzes
  a. Quizzes will be off type multiple choice, fill-in-the-blanks or match the columns.
  b. Quizzes will be held periodically
- Home works and assignments
  a. The assignments/home-works may be of multiple choice type or comprehensive type.
  b. They will be available online but submission will be carried out in hand written form.
  c. The grades and detailed solution of assignments (off both types) will be accessible online
     after the submission dead line.
- Projects
  a. Will be assigned in the mid part of the course and should be completed and submitted
     before the end of the course.
  b. The presentation and grading will be available online.
- Sessional and final examinations
  a. These will be comprehensive examinations held on campus (sessionals) or off-campus
     (external) on dates fixed by the Mahamaya Technical University.
1. **Title of the Course:** CE -302 : Mechanics of Solids

2. **Work Load**
   e. Lecture(L) : 3 hours/Week Total lecture hours per semester: 42
   f. Tutorial (T): 1 hour/Week Total tutorial hours per semester: 14
   g. Practicals(P): 2 hours/Week Total lab hours per semester: 28
   h. Total credits: L+T+P 5
      *One credit is defined as one lecture load per week and 2 hours of self study to be counted with tutorials.

3. **Prerequisites of the course:** Basic knowledge of Engineering Mechanics of 1st year.

4. **Prerequisites for which next course :** The course is prerequisite for
   - Structural Analysis 1
   - Structural Analysis 2
   - Design of Concrete Structures 1 and 2
   - Bridge Engineering

5. **Why you need to study this course:**
   Mechanics of Materials is an important course for Civil and Mechanical Engineering. **Mechanics of materials**, also called **strength of materials** is a subject which deals with the behavior of objects withstanding stresses and strains. The study of strength of materials often refers to various methods of calculating stresses in structural members, such as beams, columns and shafts. The methods employed to predict the response of a structure under loading and its susceptibility to various failure modes may take into account various properties of the materials other than material yield strength and ultimate strength; for example, failure by buckling is dependent on material stiffness and thus **Young’s Modulus**.

6. **Course objective:**
   - To provide knowledge about the behavior of materials under varying loading conditions.
   - To allow a student to build ability to apply knowledge of basic science and engineering fundamentals.
   - To enable a student about the procedure involved in the analysis of forces developed in a body.
   - The subject will enable a student to have knowledge about the stresses produced and their effects on its geometry.
   - To provide an insight into the safe designing of a structure to avoid failure.

7. **Learning outcomes expected from the course :**
   At the completion of course, student will have the basic skills required to:
   1. Determine the external forces and moments acting on a solid object in a state of equilibrium.
   2. Determine the states of stress and strain at any point within a linearly elastic solid loaded in tension, compression, or torsion.
   3. Determine the distribution of internal shear forces, bending moments, and corresponding stresses and deformations within an elastic beam loaded in bending.
   4. Determine the principal stresses, principal strains, and the maximum shear stress acting at any point in a loaded solid object.
   5. Determine the stress in a solid object subjected to a combination of tension, compression, internal pressurization, torsion, or bending to determine whether static failure would be expected to occur within the object.
8. **Aims:**
   The aim of this subject is to study fundamentals of Mechanics of Solids and to provide advanced level theoretical background and to strengthen experimental skills ,to gain the ability of evaluation of analysis results and solving engineering problems efficiently as well as experimental studies. This subjects serves as the foundation for all the structural designing methods. The subject provide basic insight into the analysis of a structure ,subjected to loads and various composite loadings.

9. **Details of Syllabus of the Course**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>TOPIC</th>
<th>TEXT BOOK Ref:</th>
<th>LECTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>• Introduction of simple stress</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>• Introduction of strain</td>
<td>2</td>
<td>1</td>
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<tr>
<td></td>
<td>• Hooke’s Law</td>
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<td></td>
<td>• Poisson’s Ratio</td>
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<td>• Elastic constants</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>• Deformation of axially loaded bars.</td>
<td>3</td>
<td></td>
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<tr>
<td></td>
<td>• Thermal strain and deformation</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>• State of plane stress ,principal stress and strain</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>• Mohr’s stress circle</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>• 3 D state of stress and strain and equilibrium equations.</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>• Generalised hooke’s law ,Theories of failure ,castigliano’s theorem ,impact load and stresses.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| II   | • Introduction to Bending Moment and Shear Force | 10         | 3        |
|      | • Stresses in beams: | 18         | 2        |
|      | ß Bending stresses | 11         | 2        |
|      | ß Combined direct and bending stress ,composite beams ,beams of uniform strength. |          | 1        |
|      | ß Shear stress. | | |
|      | • Deflection of beam | | |
|      | • Equation of elastic curve, cantilever and simply supported beam | 2          | |
|      | • Macaulay's method (Double Integration Method),Area Moment method | 2          | 3        |
|      | • Fixed beam and continuous beam | | |
|      | • Clapeyron's theorem and its application for analysis of continuous beam | | |

| III  | • Torsion: | 21         | 1        |
|      | • shear stress due to torsion ,combined bending and torsion of solid and hollow circular shaft | 21         | 2        |
|      | • Helical and leaf springs : | 22         | 1        |
|      | • Deflection of springs by energy method, | 22         | 2        |
|      | • Helical springs under axial load and under axial twist (respectively for circular and square crossections). | | |
|      | • Columns and struts: | | |
|      | • Combined bending and direct stress | 20         | 2        |
|      | | 20         | 1        |
|      | | 20         | 1        |
### Middle third and middle quarter rules.
- Struts with different end conditions
- Euler’s theory and experimental results
- Rankine Gordon formulae

### IV
- **Thin cylinders and spheres:**
  - Hoop and axial stress
  - Hoop and axial strain
  - Volumetric strain
- **Thick cylinders:**
  - Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures
  - Compound cylinders
  - Stresses due to interference fits

### V
- **Curved Beams:**
  - Bending of beams with large initial curvatures
  - Location of neutral axis for rectangular, trapezoidal and circular cross sections
- **Unsymmetrical bending**
  - Properties of beam crosssection
  - Slope of Neutral axis
  - Computation of stresses and deflection
  - Shear centre, its location for common structural sections

### 10. Lab. CE-302P
1. Strength testing of a given mild steel specimen on UTM with full details and s-e plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact testing on impact testing machine like Charpy, Izod or both.
5. Spring index testing on spring testing machine.
6. Fatigue testing on fatigue testing machine.
7. Deflection of beam experiment, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young’s modulus of beam.
8. Torsion testing of a rod on torsion testing machine.

### 11. (a) Text Books:

### 11. (b) References:

### 12. Evaluation methodology to be followed
The evaluation and assessment plan consist of the following components:
- Class attendance and participation in class discussion in lecture and practicals etc.
- Quizzes for lecture and practicals
- Home-works and assignments
- Projects
- Sectional examinations
f. Final examination

13. Award classification
Assessment procedure will be as follows:

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  a. Substantial in-class contribution about class topics and discussion questions
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  a. The assignments/home-works may be of multiple choice type or comprehensive type.
  b. They will be available online but submission will be carried out in handwritten form.
  c. The grades and detailed solution of assignments (of both types) will be accessible online after the submission deadline.

- Projects
  a. Will be assigned in the middle part of the course and should be completed and submitted before the end of the course.
  b. The presentation and grading will be available online.

- Sessional and final examinations
  a. These will be comprehensive examinations held on campus (sessionals) or off-campus (external) on dates fixed by the University.
Surveying

1. **Title of the Course**: CE-303 : Surveying

2. **Work Load**
   - i. Lecture (L): 3 hours/Week  Total lecture hours per semester: 42
   - j. Tutorial (T): 1 hour/Week  Total tutorial hours per semester: 14
   - k. Practials (P): 2 hours/Week  Total lab hours per semester: 28
   - l. Total credits: L+T+P  5

   *One credit is defined as one lecture load per week and 2 hours of self study to be counted with tutorials.*

3. **Prerequisites of the course**: Basic knowledge of physics & Mathematics

4. **Prerequisites for which next course**: The course is prerequisite for
   - • Geoinformatics
   - • Highway, Railway, canal, etc.
   - • Bridge Engineering
   - • Project work
   - • Planning & construction
   - • All types of maps

5. **Why you need to study this course**:
   Survey is an important subject for civil engg. of special importance during the planning and construction. It gives the knowledge of distance and direction of an existing feature either natural or man-made on the ground surface with respect to other. The aim of surveying is to prepare a map showing the relative position of the feature or object on the surface of the earth. Without surveying we can not start any project in the field such as roads, railway, building etc. It can be classified on the basis of purpose, place of survey and the instrument used.

6. **Course objective**:
   - • To understand the importance of surveying in engineering.
   - • To understand the classification of surveying and error developed.
   - • To measure the horizontal distance accurately.
   - • To measure the vertical distance of points on the surface of earth.
   - • To plot the contour map taking the elevation of points in the field.
   - • How the plane tabling is done in the field showing the details on the map with respect to ground existing features.
   - • To know the triangulation and trilateration figure regarding the field survey.
   - • To understand about the curve which is provided in highway, railway etc and importance of curve.

7. **Learning outcomes expected from the course**:
   At the completion of course, student will have the basic skills required to:
   - e) Find out the relative position of a natural or artificial object on, above or below the surface of earth.
   - f) To establish the BM for any project
   - g) To find out the area required for project.
   - h) To set out the curve in highway and railway which is most important
   - i) To find out the distance and direction of an object directly or indirectly
   - j) To prepare a map of an area with existing features suitably

8. **Aims**:
   This course will provide a fair knowledge to the students
   - • Able to find out the position of an object existing on the map relative to the ground
   - • Able to know the difference between the plan and a map
• How to practical work is done in the field
• Able to know the importance of surveying
• Able to know the error developed in the field work and how it can be removed
• How the project work can be started in field accurately

9. Details of Syllabus of the course

<table>
<thead>
<tr>
<th>UNIT</th>
<th>TOPIC</th>
<th>TEXT BOOK Ref: 1</th>
<th>LECTURES</th>
</tr>
</thead>
</table>
| UNIT I | **Introduction of surveying and its basic concepts:**  
- Definition, importance of surveying in engineering, primary division of surveying and its classification.  
- Principles of surveying, precision in surveying, difference between a plan and a map.  
**Survey measurement errors and their propagation:**  
- Concept of errors in measurements, accuracy and precision.  
- Types of errors, propagation of errors. | TB – 1(i) – 1 | 1 |
| | | TB – 1(i) – 1 | 1 |
| | | TB – 1(i) – 2 | 1 |
| | | TB – 1(i) – 2 | 1 |
| UNIT II | **Measurement of horizontal distances:**  
- Direct, indirect and EDM.  
- Methods of distance measurements, Different kinds of tapes.  
- Ranging, difficulties and obstructions in ranging and taping (chaining), tape corrections.  
**Measurement of vertical distances:**  
- Direct and indirect methods, effect of curvature and refraction, Definitions of basic terms.  
- Differential leveling, booking, reduction, applying checks.  
- Different types of levels and leveling, Precautions and errors in leveling.  
- Trigonometric leveling. | TB – 1(i) – 3 | 1 |
| | | TB – 1(i) – 3 | 1 |
| | | TB – 1(i) – 3 | 2 |
| | | TB – 1(i) – 6 | 1 |
| | | TB – 1(i) – 6 | 1 |
| | | TB – 1(i) – 6 | 1 |
| UNIT III | **Measurement of horizontal and vertical angles:**  
- Concept of horizontal and vertical angles.  
- Meridians, bearings, magnetic declination, and local attraction, prismatic and surveyor’ s compass.  
- Vernier theodolite and functions of its different parts, definitions and technical terms.  
- Geometry of theodolite, temporary and permanent adjustments of theodolite.  
- Angle and direction measurements with a theodolite.  
**Contouring:**  
- Definition of contour horizontal equivalent and contour gradient and their uses.  
- Characteristics of contours, interpolation and use of contours in civil engineering.  
**Stadia method of surveying:**  
- Principle of stadia system. Horizontal and vertical distance measurement, substance bar. | TB – 1(i) – 4 | 1 |
| | | TB – 1(i) – 5 | 1 |
| | | TB – 1(i) – 4 | 1 |
| | | TB – 1(i) – 4 | 1 |
| | | TB – 1(i) – 7 | 1 |
| | | TB – 1(i) – 7 | 1 |
| | | TB – 1(i) – 8 | 2 |
| UNIT IV | **Traverse surveying:**  
- Definition of traversing and its purpose, Types of traverse.  
- Traverse computations, adjustments and plotting of traverse. | TB – 1(i) – 9 | 1 |
| | | TB – 1(i) – 9 | 1 |
| | | TB – 1(i) – 10 | 1 |
**Plane table surveying:**
- What is plane tabling and its advantages and disadvantages.
- Basic definitions, plane table and its accessories.
- Method of plane tabling, resection-three-point problem, precautions in plane tabling.

**Construction surveying:**
- Introduction, horizontal and vertical control.
- Positioning of structure, setting out works-building, culvert, bridge, slopes.

**UNIT V**

**Triangulation and Trilateration:**
- Definition of triangulation and trilateration, classification of triangulation.
- Triangulation figures, signals, towers.
- Strength of figure, intervisibility of stations, phase correction.
- Satellite station, triangulation field work.

**Horizontal and vertical curves:**
- Different types of curves and their uses.
- Element of simple circular curves, designation of circular curves.
- Setting out simple circular curves.
- Transition curve and its characteristics.
- Ideal transition curve and its equation.
- Vertical curves.

<table>
<thead>
<tr>
<th>Question Numbers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>What is the topographical map? What types of symbols are used in the map? Give the accurate symbol with colour with reference to objects existing on the ground.</td>
</tr>
<tr>
<td>2.</td>
<td>How can you measure the FB and BB of a line with prismatic compass in the field? Also detect the error in closed traverse and adjust this error by graphical method.</td>
</tr>
<tr>
<td>3.</td>
<td>How can you find out the reduced level of points with Dumpy level/Auto level in field? Describe the methods and tabulate the observations properly and check your results. Which method is suitable for finding out the RL of points.</td>
</tr>
<tr>
<td>4.</td>
<td>How can you perform the fly leveling with Dumpy/Auto level in the field? For what purpose this leveling is done?</td>
</tr>
<tr>
<td>5.</td>
<td>Draw the neat sketch of vernier theodolite and show the different parts and make a list of these parts correctly. How can you measure the HA, VA? What is LC of vernier theodolite? Fill up the observations in the observation table.</td>
</tr>
<tr>
<td>6.</td>
<td>Describe the method of repetition to find out the horizontal angle between two objects at least three repetition recording.</td>
</tr>
<tr>
<td>7.</td>
<td>How can you measure the horizontal angle with the vernier theodolite between two objects by method of reiteration in the field? Also check your results.</td>
</tr>
<tr>
<td>8.</td>
<td>How can you measure the elevation of chimney or building top by trigonometrical leveling by taking observation in single vertical plane? Also draw a neat sketch of chimney top.</td>
</tr>
<tr>
<td>9.</td>
<td>What is simple circular curve? What are the datas required to set out a simple curve? What is Rankine’s method and how will you set out the simple circular curve by Rankine’s method?</td>
</tr>
<tr>
<td>10.</td>
<td>What is total station? Differentiate between the EDM and Total station. Describe the method to find out the HA, VA, slope distance.</td>
</tr>
</tbody>
</table>

**11. Text Books:**

5. Dr. A M Chandra – (i) Plane Surveying and (ii) Higher Surveying by New Age International Publishers, Delhi
6. S K Duggal – Surveying (Vol 1 & Vol 2) by TMH
12. References:
1. B C Punmia – Surveying & Leveling (Vol 1 & 2) by Laxmi Publication, New Delhi
2. R Agor – Surveying (Vol I & II) by Khanna Publication, Delhi
4. N Kanctkar – Surveying & Leveling (Vol I & II)

13. Evaluation methodology to be followed
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   a. Class attendance and participation in class discussion in lecture and practicals etc.
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   c. Home-works and assignments
   d. Projects
   e. Sectional examinations
   f. Final examination

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     b. Response to other students’ queries
     c. Contribution in discussion and chat sessions
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     a. Quizzes will be off type multiple choice, fill-in-the-blanks or match the columns.
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   • Home works and assignments
     a. The assignments/home-works may be of multiple choice type or comprehensive type.
     b. They will be available online but submission will be carried out in hand written form.
     c. The grades and detailed solution of assignments (off both types) will be accessible online
        after the submission dead line.
   • Projects
     a. Will be assigned in the mid part of the course and should be completed and submitted
        before the end of the course.
     b. The presentation and grading will be available online.
   • Sessional and final examinations
     These will be comprehensive examinations held on campus (sessionals) or off-campus
     (external) on dates fixed by the University.
Human Values & Professional Ethics
(Syllabus for the Value Education Course to be introduced in MTU Colleges/Institutes)
Subject Code-AU-301/AU-401

Course Objective

This introductory course input is intended

a. To help the students appreciate the essential complementarily between ‘VALUES’ and ‘SKILLS’ to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
b. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of value based living in a natural way.
c. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with nature.

Thus, this course is intended to provide a much needed orientational input in Value Education to the young enquiring minds.

Course Methodology

- The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence.
- It is free from any dogma or value prescriptions.
- It is a process of self-investigation and self-exploration and not of giving sermons. Whatever is found as truth or reality is stated a proposal and the students are facilitated to verify it in their own right based on their Natural Acceptance and Experiential Validation
- This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with and within the student himself/herself family.
- This self-exploration also enables them to evaluate their pre-conditionings and present beliefs.

Course Code-AU-301/AU-401

Total No.of Lectures : 28     L-T-P:2-1-0
Total No.of Practice Sessions: 14 (of 1 hr. each)

Content for Lectures:

Unit-I
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

(6)

1. Understanding the need, basic guidelines, content and process for Value Education.
2. Self Exploration-what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation-as the mechanism for self exploration
3. Continuous Happiness and Prosperity-A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities-the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.
Unit-II

Understanding Harmony in the Human Being-Harmony in Myself

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
8. Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Swasthya
   - Practice Exercised and Case Studies will be taken up in Practice Sessions.

Unit-III

Understanding Harmony in the Family and Society -Harmony in Human-Human Relationship

13. Understanding harmony in the Family- the basic unit of human interaction
14. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti;
   Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
15. Understanding the meaning of Vishwas; Difference between intention and competence
16. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
17. Understanding the harmony in the society (society being an extension of family):
   Samadhan, samridhi, Abhay, Sah-astitva as comprehensive Human Goals
18. Visualizing a universal harmonies order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family.
   - Practice Exercise and Case Studies will be taken up in Practice Sessions.

Unit-IV

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

19. Understanding the harmony in the Nature
20. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulations in nature
21. Understanding existence as Co-existence (Sah-astitva) of mutually interacting unites in all-pervasive space.
22. Holistic perception of harmony at all levels of existence
   - Practice Exercise and Case Studies will be taken up in Practice Sessions.

Unit-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

23. Natural acceptance of human values
24. Definitiveness of Ethical Human Conduct
25. Basis of Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26. 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 eco-friendly production systems
c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

27. Case studies of typical holistic technologies, management models and production systems
28. Strategy for transition from the present state to universal Human Order;
   a. At the level of individual: as socially and ecologically responsible engineers, technologies and mangers.
   b. At the level of society: as mutually enriching institutions and organizations

**Content for Practice Sessions:**

**Unit-I**

**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

**PS 1:** Introduction yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them.

**Expected Outcome:** the students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

**PS 2:** Now a days, there is a lot of voice about many techno-genic maladies such as energy and natural resource depletion, environment pollution, global warming, ozone depletion, deforestation, soil degradation, etc. - all these seem to be man-made problems threatening the survival of life on Earth. What is the root cause of these maladies & what is the way out in your opinion?

   On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression & suicidal attempts, etc - what do you thing, is the root cause of these threats to human happiness and peace - what could be the way out in your opinion?

**Expected Outcome:** the students start finding that technical education without study of human values can generate more problems than solutions. They also start feeling that lack of understanding of human values is the root cause of all problems and the sustained solution could emerge only through understanding of human values and value based living. Any solution brought fear, temptation or dogma will not be sustainable.

**PS 3:**

1. Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of:
   (i) What is Naturally Acceptable to you in relationship - Feeling of respect or disrespect?
   (ii) What is Naturally Acceptable to you - to nurture or to exploit others?
    Is your living the same as your natural acceptance or different?

2. Out of the three basic requirements for fulfillment of your aspirations - right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time & effort your devote for each in your daily routine.

**Expected Outcome**

1. The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify right or wrong, and referring to any external
source like text or instrument or nay other person cannot enable them to verify with authenticity; it will only develop assumptions.

2. The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time and all they need to do is to refer to their natural acceptance to remove this disharmony.

3. The students are able to see that lack of right understanding leading to lack of relationship is the major cause of problems in their family and not the lack of physical facilities in most of the cases, while they have given higher priority to earning of physical facilities in their life ignoring relationships and not being aware that right understanding is the most important requirement for any human being.

**Unit-II**

**Understanding Harmony in the Human Being-Harmony in Myself**

**PS 4:** List down all your desires. Observe whether the desire is related to Self (I) or Body. If it appears to be related to both, see which part of it is related to Self (I) and which part is related to Body.

**Expected Outcome:** the students are able to see that they can enlist their desires and the desires are not vogue. Also they are able to relate their desires to ‘I’ and ‘Body’ distinctly. If any desire appears related to both, they are able to see that the feeling is related to I while the Physical facility is related to the body. They are also able to see that ‘I’ and ‘Body’ are two realities, and most of their desires are related to ‘I’ and not body, while their efforts are mostly centered on the fulfillment of the needs of the body assuming that it will meet the needs of ‘I’ too.

**PS 5:**

1. (a) Observe that any physical facility you use, follows the given sequence with time:
   Necessary & tasteful-unnecessary & tasteful-unnecessary & tasteless-intolerable

   (b) In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If naturally acceptable, you want it continuously and if not acceptable, you do not want it any moment.

2. List down all your activities. Observe whether the activity is of ‘I’ or of Body or with the participation of both ‘I’ and Body.

3. Observe the activities within ‘I’. Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

**Expected Outcome:**

1. The students are able to see that all physical facilities they use are required for limited time in limited quantity. Also they are able to see that in case of feelings, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable even for a single moment.

2. The students are able to see that activities like understanding, desire, thought and selection are the activities of ‘I’ only, the activities like breathing, palpitation of different parts of the body are fully the activities of body with the acceptance of ‘I’ while the activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs etc. are such activities that require the participation of both ‘I’ and body.
3. The students become aware of their activities of ‘I’ and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance.

**PS 6:**

1. Chalk out programs to ensure that you are responsible to your body-for the nurturing, protection and right utilization of the body.
2. Find out the plants and shrubs growing in and around your campus. Find out their use for curing different diseases.

**Expected Outcome:** The Students are able to list down activities related to proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing different diseases.

**Unit-III**

**Understanding Harmony in the Family and Society -Harmony in Human-Human Relationship**

**PS 7:** From small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are:

1a. Do I want to make myself happy?  
1b. Am I able to make myself always happy?  
2a. Do I want to make the other happy?  
2b. Am I able to make the other always happy?  
3a. Does the other want to make him happy?  
3b. Is the other able to make him always happy?  
4a. Does the other want to make me happy?  
4b. Is the other able to make me always happy?  

What is the answer?  
Intention (Natural Acceptance)  
Competence  

Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate your intention & competence as well as the others & competence.

**Expected Outcome:** The students are able to see that the first four questions are related to our Natural Acceptance i.e. intention and the next four to our Competence. They are able to note that the intention is always correct, only competence is lacking! We generally evaluate ourselves on the basis of our intention and others on the basis of their competence! We seldom look at our competence and others’ intentions as a result we conclude that I am a good person and other is a bad person.

**PS 8:**

1. Observe on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under-evaluation, over-evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

**Expected Outcome:** the students are able to see that respect is right evaluation, and only right evaluation leads to fulfillment in relationship. Many present problem in the society are and outcome of differentiation (lack of understanding of respect), like gender biasness, generation gap, caste conflicts, class struggle, dominations through power play, communal violence, clash of isms, and so on so forth. All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and
program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

**PS 9:**

1. Write a note in the form of story, poem, skit, essay, narration, dialogue to educate a child. Evaluate it in a group
2. Develop three chapters to introduce ‘social science-its need, scope and content’ in the primary education of children

**Expected Outcome:** The students are able to use their creativity for education children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the exiting model.

**Unit-IV**

**Understanding Harmony in the Nature and Existence - Whole existence as Co-existence**

**PS 10:** List down units (things) around you. Classify them in for orders. Observe and explain the mutual fulfillment of each unit with other orders.

**Expected Outcome:** The students are able to differentiate between the characteristics and activities of difference orders and study the mutual fulfillment among them. They are also able to see that human beings are not fulfilling to other orders today and need to take appropriate steps to ensure right participants (in terms of nurturing, protection and utilization) in the nature.

**PS 11:**

1. Make a chart for the whole existence. List down different courses of studies and relate them to different units or levels in the existence.

2. Choose any one subject being taught today. Evaluate it and suggest suitable modifications to make it appropriate and holistic.

**Expected Outcome:** The students feel confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and pint out how different courses of study related to the different units and levels. Also they are able to make out how these courses can be made appropriate and holistic.

**Unit-V**

**Implications of the above Holistic Understanding of Harmony on Professional Ethics**

**PS 12:** Choose any two current problems of different kind in the society and suggest how they can be solved on the basis of natural acceptance of human values. Suggest steps you will take in present conditions.

**Expected Outcome:** the students are able to present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.

**PS: 13**

1. Suggest ways in which you can use your knowledge of Technology/Engineering/ Management for universal human order, from your family to the world family.
2. Suggest one format of humanistic constitution at the level of nation from your side.

**Expected Outcome:** The students are able to grasp the right utilization of their knowledge in their streams of Technology/Engineering/Management to ensure mutually enriching and recyclable productions systems.

**PS:14** The course is going to be over now. Evaluate your state before and after the course in terms of:

a. Thought  
b. Behavior  
c. Work and  
d. Realization

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

**Expected Outcome:** The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make us of their understanding in the course for a happy and prosperous society.

### Term Paper

#### Text Book and Reference Material

**a. The text book:**

**b. Teacher’s Manual:**

Video CD of Teacher Orientation Workshop will be made available on website.

**c. Reference Books**
7. AN Tripathy, 2003, Human Values, New Age International Publishers  
8. Subhas Palekar, 2000, How to practice Natural farming, Pracheen (vaidik) Krishi Tantra Shodh, Amravati  

**d. Relevant websites, CDs, Movies and Documentaries:**
1. Value Education website, [http://www.uptu.ac.in](http://www.uptu.ac.in)  
3. AL Gore, An Inconvenient Truth, Paramount Classics, USA  
4. Charlie Chaplin, Modern Times, United Artists, USA  
5. IIT Delhi, Modern Technology-the Untold Story  
6. Anand Gandhi, Right here right now, Cyclewala Production
AS-402: Basics of System Modelling & Simulation

Course Description:
This course will cover both theoretical & application aspects of mathematical modelling of existing or new basic systems to demonstrate the concepts of modelling, approach and use of simulation techniques and their relationships to the real world systems.

Course Objectives:

1. To present concepts of computer modelling and simulation to various natural, man-made, social and engineering systems.
2. The course will provide experience of modelling & simulation specifically suited to engineering systems to show how it can help in the analysis, design, performance evaluation, operational behaviour and assessment of performance & efficiency with respect to specific goals.

Learning Outcomes:

1. Understand the modelling concepts & types of models used to represent different classes of real world systems.
2. Applying various mathematical concepts & techniques to define physical, natural & social systems.
4. Understand how to evaluate, validate & verify models of simple systems.
5. Understand how complex and heterogeneous systems can be simplified and modelled for a specific task and thus understand the limitations of modelling & simulation.

Cognitive Skills learnt:

1. Ability to mathematically model any system from various fields.
2. Ability to implement simple numerical algorithms to solve various modelling equations that are used to describe real world systems.
3. Ability to select suitable techniques for generating system models, simulate them on computers and evaluate the system performance.

Course Pre-requisites: Probability & Statistical Method

Course Content:

Unit -I: Introduction to System Modelling & Simulation: (7 lectures)
Need & use of Simulation, system models, advantages & limitations of models, simplified representation of complex & large systems, Principals & Steps in creating system models, capturing system environment, components of systems and selection of appropriate modelling techniques & simulation methodologies; relationships between selected models & simulation techniques.
**Unit -II: System Modelling Concepts:** (8 Lectures)

Types of system models, continuous & discrete systems, comparison of analytical & simulation methods, Event & Data Modelling, Model building, Data modelling & techniques of building useful Input Data models, multivariate & time series input models. Steps in system model building; Monte Carlo Method, verification, calibration & validation of models for simple systems.

**Unit -III: Probability & Random Number generation:** (7 Lectures)


**Unit IV: Queuing Systems & Discrete System Simulation:** (6 Lectures)


**Unit -V: Real World Application of Simulation:** (12 Lectures)

Transfer Line Model, Inventory System Model, Deadlock Detection Model, Computer Center Model, Job Shop Model, Just-In-Time Model, Pi value estimation, Capital recovery Model, Economics of Insurance policy, Reliability Estimation, Warranty Problem & Estimation, Computer Network Model. Interpretation of Confidence Interval of a Parameter.

**References & Bibliography:**


**URL:**

- [www.ocw.mit.edu](http://www.ocw.mit.edu): Course on “Introduction to Modelling & Simulation”.

**List of experiments:**

1. Simulation of Scheduling Algorithms: CPU Scheduling Techniques: FCFS, SJF, & Priority Scheduling, Using Queuing Theory
2. Simulation of Disk Scheduling Algorithms.
4. Simulation of System Reliability of any given system and determine its reliability and average failure rate based on the given component reliability.
6. Telephone Exchange Modelling & Call rate & Call drop estimation based on exchange capacity.
7. Congestion Modelling & Analysing the impact of congestion control algorithms in Mobile systems/ Computer networks/ Assembly Line operations.

Note: Students shall perform practicals in tutorial periods using Sci Lab which is freely downloadable from www.
1. **Title of the Course:** CE -401 : Structural Analysis - I

2. **Work Load**
   - m. Lecture (L): 3 hours/Week  
     Total lecture hours per semester: 42
   - n. Tutorial (T): 1 hour/Week  
     Total tutorial hours per semester: 14
   - o. Practicals (P): 2 hours/Week  
     Total lab hours per semester: 28
   - p. Total credits: L+T+P  5
     *One credit is defined as one lecture load per week and 2 hours of self study to be counted with tutorials.

3. **Prerequisites of the course:** knowledge of Engineering Mechanics, Mechanics of solids

4. **Prerequisites for which next course:** The course is prerequisite for
   - Structure Analysis II
   - Design of concrete Structure
   - Design of steel structure
   - Bridge Engineering
   - Earthquake Resistant Design

5. **Why you need to study this course:**
   Structure Analysis is a foundation course of Civil Engineering Design. It makes us to understand about the structural behavior of various structural elements under different loading condition i.e., when the load is applied on it and how much load a structure can withstand without failure. It is prerequisite of design. It also enables structural designer to understand the serviceability and durability of various structural elements.

6. **Course objective:**
   1. Students will learn about establishing different types of structures and degree of determinacy, calculating reactions and internal forces (axial force, shear, and bending moment) for determinate and indeterminate structures and its components.
   2. Students will learn about calculating deflections and constructing influence lines for beams and frames.
   3. Students will learn how to use structural analysis software for analysis of multi degree of indeterminate structures.
   4. Familiarity with structural analysis software
   5. Familiarity with professional and contemporary issues

7. **Learning outcomes expected from the course:**
   At the completion of course, student will have the basic skills required to:
   - k) Students should know how to plot Bending Moment and shear force diagram of beams under various loading and supporting conditions
   - l) Students should know the point of maximum deflection and slope
   - m) Analysis of column
   - n) Various methods of analysis for determinate and indeterminate structure
   - o) Analysis of various types of arch and suspension bridge

8. **Aims:**
   This course will provide a fair knowledge to the students
   - This is the pre-requisite of RCC and steel structure design
   - Study of serviceability and durability criteria
   - To understand the behavior of structure under different loading conditions
   - Behavior of structure during rolling load
   - Learning of various analysis software's
## 9. Details of Syllabus of the Course

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<td></td>
<td>Degree of freedom per node</td>
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<td>Static and kinematic determinacy</td>
<td>3</td>
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<td>Classification of pin jointed determinant truss</td>
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<td>Analysis of determinant plan and space truss</td>
<td>3</td>
<td>2</td>
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<td>(compound and complex)</td>
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<td>Method of Substitution</td>
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<td>Method of tension coefficient</td>
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<td>II</td>
<td><strong>Shear force and bending moment</strong></td>
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<td>• Shear force and bending moment, Differential</td>
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<td>equation for equilibrium</td>
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<td>• Shear force and bending moment diagrams for</td>
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<td>statically determinate structures, beam, cantilever,</td>
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<td>simply supported beam</td>
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<td>• Determinate over hanging beam under point load,</td>
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<td>uniformly distributed load, uniformly varying load</td>
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<td>determinate structure</td>
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<td>IV</td>
<td>• Analysis of Arches</td>
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<td>• Linear Arch</td>
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<td>• Eddy's theorem</td>
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<td>• Three hinged parabolic arch</td>
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<td>• Circular arch</td>
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<td>• Moving load and influence line</td>
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<td>1</td>
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<td>• Castigliano's First theorem</td>
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<td></td>
<td>• Unit load and Conjugate beam method</td>
<td>8</td>
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</table>

### 10. Lab.CE-401P

1. To determine flexural rigidity (EI) of a given beam
2. To verify Maxwell's Reciprocal Theorem
3. To find horizontal thrust in a three hinged arch
4. To draw influence line diagrams for horizontal thrust and B.M. for a three hinged arch
5. To find horizontal thrust in a two hinged arch
6. To draw influence line diagrams for horizontal thrust and B.M. for a two hinged arch
7. To find deflection of curved members
8. To find bar forces in a three members structural frames with pin jointed bar
9. To find critical load in struts with different end conditions
10. To find deflections in beam having unsymmetrical bending
11(a) Text Books:
1. S Ramamrutham, "Theory of Structures" Dhanpat rai publication

11 (b) References:
1. B.C. punmia, "Theory of Structure" Laxmi Publications (P) Ltd
3. T S Thandavmorthy, "Analysis of Structures", Oxford University press

12. Evaluation methodology to be followed

The evaluation and assessment plan consist of the following components:

g. Class attendance and participation in class discussion in lecture and practicals etc.
h. Quizzes for lecture and practicals
i. Home-works and assignments
j. Projects
k. Sectional examinations
l. Final examination

13. Award classification

Assessment procedure will be as follows:

- Class attendance and participation in discussion will be based on:
  d. Substantial in-class contribution about class topics and discussion questions
  e. Response to other students’ queries
  f. Contribution in discussion and chat sessions
- Quizzes
  c. Quizzes will be off type multiple choice, fill-in-the-blanks or match the columns.
  d. Quizzes will be held periodically
- Home works and assignments
  d. The assignments/home-works may be of multiple choice type or comprehensive type.
  e. They will be available online but submission will be carried out in hand written form.
  f. The grades and detailed solution of assignments (off both types) will be accessible online after the submission dead line.
- Projects
  c. Will be assigned in the mid part of the course and should be completed and submitted before the end of the course.
  d. The presentation and grading will be available online.
- Sessional and final examinations
  b. These will be comprehensive examinations held on campus (sessionals) or off-campus (external) on dates fixed by the Mahamaya Technical University.
Geoinformatics

1. **Title of the Course:** CE -402: Geoinformatics

2. **Work Load:**
   a. Lecture (L): 3 hours/Week  
      Total lecture hours per semester: 42
   b. Tutorial (T): 1 hour/Week  
      Total tutorial hours per semester: 14
   c. Practicals (P): 2 hours/Week  
      Total lab hours per semester: 28
   d. Total credits: L+T+P  5

   *One credit is defined as one lecture load per week and 2 hours of self study to be counted with tutorials.

3. **Prerequisites of the Course:** CE – 303: Surveying

4. **Prerequisites for which next course:** NIL

5. **Why you need to study this Course:**
   To make efficient use of modern technologies in the field of surveying and mapping for planning, design, and execution of the civil engineering projects, the knowledge of this subject is essential. The use of these technologies helps in saving time in collection of required data, looking the problem from different points of views, analyzing the project from different angles to yield the best solution in the required formats to different users as per their individual requirements.

6. **Learning outcomes expected from the Course:** The technologies can be effectively and efficiently used after learning this subject in various field of engineering and also non-engineering fields.

7. **Details of Syllabus:**

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<td>Fundamentals of photo interpretation</td>
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<td>Unit-II</td>
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<td>Ideal Remote Sensing System</td>
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<tr>
<td>Application of Remote sensing</td>
<td>TB1- (ii) – 7</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

### Unit-IV

| Basic concept of geographic data | TB1 – (ii) - 8 | 1 |
| GIS and its components | TB1 – (ii) - 8 | 1 |
| Data acquisition | TB1 – (ii) – 9 | 1 |
| Raster & Vector formats | TB1 – (ii) – 9 | 1 |
| Topology and data models | TB1 – (ii) – 9 | 2 |
| Spatial modelling | TB1 – (ii) – 9 | 1 |
| Data output, GIS application | TB1 – (ii) - 8 | 1 |

### Unit-V

| Introduction, satellite navigation system | TB2 – 8 | 1 |
| GPS space segment | TB2 – 8 | 1 |
| Control segment & user segment | TB2 – 8 | 1 |
| GPS satellite signals, receivers | TB2 – 8 | 1 |
| Static, kinematic and differential GPS | TB2 – 8 | 1 |

8.(a) **Text Book**:  
1. A M Chandra:  (i) Higher Surveying – NAIP, Delhi  
   (ii) Remote sensing and GIS - Narosa, Delhi  
2. S K Duggal: Surveying Vol 2

8.(b) **Reference Book**:  
1. B C Punmia: Surveying & leveling (Vol 2)  
2. M Anjireddy: Remote sensing and GIS, BS Publication  
4. GPS Land Navigation; A complete guide book for backcountry user of the NAVSTAR satellite system, Michael H Ferguson

9. **Reference materials including web source**:  
2. en.wikipedia.org/wiki/photogrammetry  
3. [www.palaeo-electronica.org/blog/?p=615](http://www.palaeo-electronica.org/blog/?p=615)  
5. [www.wasoft.de.lit/gpswebvrs.html](http://www.wasoft.de.lit/gpswebvrs.html)  
6. gpsd.berlios.de/references.html  
8. [www.ncgia.ucsb.edu/giscc/units/u002/u002.html](http://www.ncgia.ucsb.edu/giscc/units/u002/u002.html)  
10. Lab. CE-402P

1. How to determine the horizontal distance and vertical distance with the total station between the already fixed five points on the ground?
2. How to determine the horizontal angles of a given traverse with total station?
3. How layout is done for a precise traverse in a given area and compute the adjusted coordinates of survey stations?
4. How contour lines of a given area are plotted assuming continuous interval is 3 cm to 4 cm by dumpy level?
5. How plane tabling for a given area is performed in the field for locating the building, lawn etc.?
6. What is the working principle of pocket/mirror stereoscope and how it is used for the study of a aerial photograph?
7. How to determine the vertical distance between two objects on a map using the parallax bars?
8. How will you explain the visual interpretation using IRS falls colour composite?
9. How the GPS is used to locate the position of an object on the surface of earth?

11. Evaluation methodology to be followed:

The evaluation and assessment plan consists of the following components:

a. Class attendance and participation in class discussion etc.
b. Quizzes
c. Home- works and assignments
d. Sessional Examinations
e. Final Examination

12. Award Classification:

Assessment procedure will be as follows:

- Class attendance and participation in discussions will be based on:
  a. Substantial in-class contribution about class topics and discussion question.
  b. Response to other students queries
  c. Contribution in discussion and chat sessions

Quizzes

a. Quizzes will be of type multiple choices, fill in the blanks or match the columns.

b. Quizzes will be held periodically

- Home works and assignments
  a. The assignment / home - works may be of multiple choice type or comprehensive type.
  b. They will be available online but submission will be carried out in handwritten form.
  c. The grades and detailed solutions of assignment (of both types) will be accessible online after the submission deadline.

- Sessional and Final Examinations
  a. These will be comprehensive examinations held on-campus (Sessionals) or off- Campus (External) on dates fixed by the Gautam Budh / Maha Maya Technical University.
Hydraulics & Hydraulic Machines

1. **Title of the course**: CE -403 : Hydraulics & Hydraulic Machines

2. **Work Load**:
   b. Lecture (L): 3 hours/Week  
     Total lecture hours per semester: 42
   c. Tutorial (T): 1 hour/Week  
     Total tutorial hours per semester: 14
   d. Practicals (P): 2 hours/Week  
     Total lab hours per semester: 28
   e. Total credits: L+T+P 5

*One credit is defined as one lecture load per week and 2 hours of self study to be counted with tutorials and practical workbook and assignments.*

3. **Prerequisites of the course**: Basic knowledge of Ist year physics & Mathematics and also ECE 301 Fluid Mechanics, numerical methods.

4. **Prerequisites for which next course**: The course is prerequisite for
   - Engineering Hydrology
   - Advance open channel flow
   - Analysis and design of Hydraulic Structures
   - River Engineering
   - Water resources Engineering
   - Water power Engineering
   - Environmental Engineering (Water supply and sanitary Engineering)

5. **Why do you need to study this course?**

   Hydraulics and hydraulic machines is an important course for civil engineers it makes you to understand the mechanism of water flow by gravity in open channels, canals and rivers. It allows you to calculate the velocity of flow in open channel if physical parameters of the channel are given and the discharge through it. You will be able to understand and calculate the depth and scope of backwater surface behind weirs, barrages and spillway. It helps you appreciate the phenomena of hydraulic jump forming under spillway and the amount of energy lost through it. One can get the idea of different slopes and corresponding depths forming in a channel also it gives a comprehensive idea of various types of turbines, their characteristics & performance as it needed for the water power production. Rota dynamics pumps needed for various purposes for water pumping is a significant part of the course.

6. **Course Objective**

   - To understand and apply the concept of Specific Energy and Specific force in open channel flows.
   - To understand the concept of critical depth and apply it for design of horizontal and vertical contractions.
   - To understand velocity of flow and slope relation, along with other channel parameters in equations of velocity flow formulas.
   - To understand flow profiles in channels having gradually varied non-uniform flow.
   - To apply numerical, analytical method for integration of gradually varied flow equation.
   - To study the phenomena of rapidly varied flow as applied to Hydraulic jump and wave.
   - To study the working, performance characteristics, efficiencies in case of Rota dynamic pumps, and Rota dynamic machines as needed for water pumping and water power generation.
7. Learning outcomes expected from the course

At the end of the course students will have the skill required to:

(a) Analyze the open channel gravity flow phenomena in rivers and canals.
(b) Calculate back water effect caused by weirs and spillways.
(c) To understand the phenomena of Energy dissipation below canal drops and spillways and to design
hydraulic jump type energy dissipaters.
(d) To be able to select the type of turbines required in a given situation for water power generation and
pumping machine for water supply purpose.

8. AIMS

This course will provide good knowledge to the students

• To deal with design of canals, and river training works.
• To be able to design Energy dissipaters below drop structures to save soil erosion.
• To assess the submergence effect U/S of weirs and spillways during flow of flood.
• To be able to understand the working of pumps and turbines.

9. Details of Course Syllabus

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book Chapter</th>
<th>Lectures</th>
</tr>
</thead>
</table>
| I    | • Differentiate between open channel flow & Pipe flow
      |        | 1                 | 1        |
|      | • Continuity Equation
      |        | 1                 | 1        |
|      | • Critical depth, Concept of specific energy, application of specific energy principle for interpretation of open channel phenomena.
      |        | 2                 | 3        |
|      | • Flow through Horizontal and Vertical contractions
      |        | 2                 | 1        |
| II   | Uniform Flow in open channel
      |        | 3                 | 3        |
|      | • Chezys equation and Manning’s equation for flow in open channel
      |        | 2                 | 2        |
|      | • Uniform flow computations
      |        | 2                 | 2        |
|      | • Velocity distribution, most efficient channel sections
      |        | 2                 | 2        |
| III  | Gradually Varied Flow
      |        | 4                 | 1        |
|      | • Equation of gradually varied flow and its limitations
      |        | 4                 | 1        |
|      | • Flow classification and surface profiles
      |        | 5                 | 2        |
|      | • Integration of varied flow equation by analytical and Numerical methods.
      |        | Ref:3             | 4        |
|      | • Flow in channels of non linear alignment
      |        | Ref:3             | 1        |
| IV   | Rapidly Varied Flow
      |        | 6                 | 5        |
|      | • Specific Force, application of specific force for Hydraulic Jump calculation in rectangular & non rectangular channels on horizontal and sloping beds
      |        | 6                 | 5        |
|      | • Classification of Hydraulic jump
      |        | 6                 | 5        |
|      | • Open channel surge.
      |        | 6                 | 5        |
|      | • Celerity of gravity wave, deep and shallow water wave
      |        | 6                 | 5        |
| V    | Hydraulic Machines
      |        | Ref: 2            | 24       |
|      | • Rota dynamic pumps (centrifugal pumps): classification on different basis
      |        | Ref: 2            | 24       |
10. Lab. CE-403P

1. To determine the Manning’s coefficient of roughness ‘n’ for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the Energy and Momentum correction factor.
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow characteristics through a horizontal contraction in a rectangular channel.
5. To calibrate a Broad crested Weir.
6. To study the characteristics of free hydraulic jump.
7. To study the Rotodynamic (Centrifugal) pump and their characteristic.
8. To study characteristics of a Reaction turbine (Either Francis or Kaplan)
9. To study characteristics of an Impulse turbine particularly Pelton Wheel.

11(a) Text Book:


11(b) References:

1. Subramanya, K., “ Flow through open channels”, TMH (for unit 1 to 4)
5. Srivastava, Rajesh, “Flow through open channel”, Oxford University Press
7. Garde, R.J., “Fluid Mechanics through problems”, New Age International

12. Evaluation methodology to be followed

The evaluation and assessment plan consist of the following components:

a. Class attendance and participation in class discussion in lecture and practical etc.
b. Quizzes for lecture and practical
c. Home-works and assignments
d. Projects
e. Sectional examinations
f. Final examination
13. **Award Classification**:

Assessment procedure will be as follows:

- **Class attendance and participation in discussions** will be based on:
  
  a. Substantial in-class contribution about class topics and discussion question.
  
  d. Response to other students queries
  
  e. Contribution in discussion and chat sessions

- **Quizzes**
  
  a. Quizzes will be of type multiple choices, fill in the blanks or match the columns.
  
  b. Quizzes will be held periodically

- **Home works and assignments**
  
  a. The assignment / home – works may be of multiple choice type or comprehensive type.
  
  b. They will be available online but submission will be carried out in handwritten form.
  
  c. The grades and detailed solutions of assignment (of both types ) will be accessible online after the submission deadline.

- **Projects**
  
  a. Will be assigned in the mid part of the course and should be completed and submitted before the end of the course.
  
  b. The presentation and grading will be available online.

- **Sessional and Final Examinations**
  
  a. These will be comprehensive examinations held on-campus (Sessionals) or off- Campus (External) on dates fixed by the University.