MAHAMAYA TECHNICAL UNIVERSITY, NOIDA

Syllabus

B. TECH. FIRST YEAR COURSES


(Effective from the Session: 2012-13)
MAHAMAYA TECHNICAL UNIVERSITY

SCHEME OF EVALUATION B. TECH. FIRST YEAR (effective from the academic year 2012-13)

SEMESTER- I

<table>
<thead>
<tr>
<th>S N</th>
<th>Code</th>
<th>Subjects</th>
<th>Periods</th>
<th>Evaluation Scheme</th>
<th>Total</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sessional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>End Semester</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CT</td>
<td>TA</td>
<td>TOT</td>
<td>P Th</td>
</tr>
<tr>
<td>1</td>
<td>AS101</td>
<td>Engineering Mathematics - I</td>
<td>3 1 0</td>
<td>30 20 50</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>AS102</td>
<td>Engineering Physics - I</td>
<td>3 0 2</td>
<td>15 10 25 15</td>
<td>80 30</td>
<td>150</td>
</tr>
<tr>
<td>3</td>
<td>CS101/</td>
<td>Computer Programming/</td>
<td>3 1 2</td>
<td>20 10 30 15</td>
<td>100</td>
<td>175</td>
</tr>
<tr>
<td>ME101</td>
<td></td>
<td>Engineering Mechanics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>EE101/</td>
<td>Electrical Engineering/</td>
<td>3 1 2</td>
<td>20 10 30 15</td>
<td>100</td>
<td>175</td>
</tr>
<tr>
<td>EC101</td>
<td></td>
<td>Electronics Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>AS103/</td>
<td>Engineering Chemistry/</td>
<td>3 0 2</td>
<td>15 10 25 15</td>
<td>80 30</td>
<td>150</td>
</tr>
<tr>
<td>ME102</td>
<td></td>
<td>Manufacturing Practices</td>
<td>2 1 2</td>
<td>15 10 25 25</td>
<td>50 50</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>*/</td>
<td>Branch Elective/</td>
<td>3 0 0</td>
<td>10 10 20</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>CE101</td>
<td></td>
<td>Energy, Environment and Ecology</td>
<td>3 0 0</td>
<td>10 10 20</td>
<td>80</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>AS105/</td>
<td>Professional Communication/</td>
<td>0 1 2</td>
<td>- - 20</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>CE102</td>
<td></td>
<td>Computer Aided Engineering</td>
<td>0 1 2</td>
<td>- - 20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Graphics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>GP101</td>
<td>General Proficiency</td>
<td>10/17</td>
<td>4/5 18</td>
<td>1000</td>
<td>27</td>
</tr>
</tbody>
</table>

*LIST OF BRANCH ELECTIVES.

AS104/AS204 Introduction to Bio Sciences (CS/EC/EE/EN/IC/EL/IT/BT/TE).
ME103/ME203 Manufacturing Science (ME/AU/MT/Chemical).
CE103/CE203 Geological Sciences (Civil Engineering).

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

Note: Grouping of batches will be done in a way that groups select either all subjects given in numerator or denominator, choice of mix of numerator and denominator is not permitted.
## SEMESTER- II

<table>
<thead>
<tr>
<th>S N</th>
<th>Code</th>
<th>Subjects</th>
<th>Periods</th>
<th>Evaluation Scheme</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>AS201</td>
<td>Engineering Mathematics - II</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>AS202#</td>
<td>Engineering Physics – II (E/M/C)</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>ME201/CS201</td>
<td>Engineering Mechanics/Computer Programming</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>EC201/EE201</td>
<td>Electronics Engineering/Electrical Engineering</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>ME202/AS203</td>
<td>Manufacturing Practices/Engineering Chemistry</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>CE201/*</td>
<td>Energy, Environment and Ecology/Branch Elective</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>CE202/AS205</td>
<td>Computer Aided Engineering Graphics/Professional Communication</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>GP201</td>
<td>General Proficiency</td>
<td>17/18</td>
<td></td>
<td>5/4</td>
</tr>
</tbody>
</table>

# Engineering Physics II paper will have two parts; first three units shall be common for all branches and fourth and fifth units will be branch specific.
- Engineering Physics II (E) – for Electrical/ Electronic etc.
- Engineering Physics II (M) – for Mechanical / Automobile / Chemical / Civil / BT etc.
- Engineering Physics II (C) - CS/ IT etc.

**TA = 10 (5 for teachers assessment plus 5 for attendance),**

**TA = 15 (10 for teachers assessment plus 5 for attendance),**

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

*Note: Grouping of batches will be done in a way that groups select either all subjects given in numerator or denominator, choice of mix of numerator and denominator is not permitted.*
B. Tech. I Semester

(Common to all branches except Biotechnology and Agricultural Engineering branches)

1. Title of the course: AS 101: Engineering Mathematics – I

2. Work load per week

   a. Lecture (L): 3 hrs/week Total Lecture Hours per Semester: 45
   b. Tutorials (T): 1 hrs/week Total Tutorial Hours per Semester: 14
   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: Knowledge of mathematics of Intermediate of U.P. Board or equivalent.

4. Prerequisite for which next course: This course is prerequisite for

   • AS-201, Engineering Mathematics – II
   • AS-301, Engineering Mathematics – III

5. 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 basic concept of differential calculus (ordinary and partial both), multiple integrals, vector calculus and matrices to understand the different subjects of engineering as well as basic sciences.

6. 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 ordinary differential equation as well as partial differential equation which are useful to all branches of engineering.
b. The concept of “rank” in matrix will enable the students to obtain important results regarding linear dependence, and also regarding the existence and uniqueness of solutions of the linear system of equations.

c. The concept of vector calculus will enable the students to understand fluid flow in mechanics, to understand heat flow, in potential theory to find the solution of Laplace equation.

d. Be able to understand the Fourier series, Special functions, Fourier Transforms and other functions in higher mathematics.

7. Details of the syllabi:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book/Topic</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Differential Calculus-I</td>
<td>Text Book 1 2.1</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>• Determination of $n^{th}$ derivative of standard functions-illustrative examples*.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Leibnitz’s theorem (without proof) and problems.</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Taylor’s and Maclaurin’s series for one variable (without proof).</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Differential coefficient of length of arc (concept and formulae without proof).</td>
<td>2.10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Curvature – Cartesian formula for radius of curvature, centre of curvature.</td>
<td>2.11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Asymptotes for cartesian coordinates only. Curve tracing (cartesian &amp; polar coordinates), simple problems.</td>
<td>5.1-5.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Note:</em> in the case of illustrative examples, questions are not to be set.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Differential Calculus-II</td>
<td>Text Book 1</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>• Partial Differentiation. Euler’s theorem. Change of variables.</td>
<td>3.2-3.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Jacobians.</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Approximation of errors.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td><strong>Multiple Integrals</strong></td>
<td>Text Book 1</td>
<td>9</td>
</tr>
<tr>
<td>---</td>
<td>----------------------</td>
<td>------------</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>• Double Integral.</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Triple Integral.</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Change of Order of Integration.</td>
<td>7.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Change of Variables.</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Application of double and triple integrals to area and volume.</td>
<td>7.2,7.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Beta and Gamma functions.</td>
<td>11.1,11.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Dirichlet’s integral and application.</td>
<td>5.7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IV</th>
<th><strong>Vector Calculus</strong></th>
<th>Text Book 1</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Vector differentiation, Vector point function.</td>
<td>15.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Gradient, divergence and curl of a vector point function and their physical interpretation.</td>
<td>15.2-15.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Vector integration: Line, surface and volume integrals.</td>
<td>16.2-16.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Statement of Green’s, Stoke’s and Gauss divergence theorems (without proof) and problems.</td>
<td>16.5-16.7</td>
<td></td>
</tr>
</tbody>
</table>
Text Books:-

Reference Books:-

10. Laboratory work: Not required.

11. Evaluation methodology to be followed:
The evaluation and assessment plan consists of the following components:

a. Class attendance and participation in class discussions 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 questions.
  
  b. Response to other students’ queries
  
  c. Contribution in discussion and chat sessions

- **Quizzes**
  
  a. Quizzes will be of 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 handwritten form.
  
  c. The grades and detailed solutions of assignments (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 Mahamaya Technical University.

--------------
B. Tech. I Semester
(Common to all branches)

1. Title of the course: AS102: Engineering Physics-I

2. Work load per week

   a. Lecture (L): 3 hrs/week  
      Total Lecture Hours per Semester: 42
   
   b. Practicals (P): 2 hrs/week  
      Total Lab Hours per Semester: 28
   
   c. Total Credits: L+T+P based  
      4

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

3. Prerequisites of the course: As a prerequisite for this course on Engineering physics I, knowledge of elementary physics like Mechanics, Optics, Waves upto the level of 10+2 is essentially required.

4. Prerequisite for which next course: This course is prerequisite for
   
   • AS-201 Engineering Physics II
   
   • Optical Fiber Communication
   
   • Laser System and Application
   
   • Electromagnetic Waves and its applications

5. Why you need to study this course:

   Engineering subjects cannot be understood without the sound knowledge of Physics. With proper understanding of this subject the knowledge gained can be applied for the development of new engineering devices. In the age of information technology, the knowledge of computing will remain unfulfilled till the quantum computing is fully understood and implemented for the further development of new computing devices. Optical fiber communication cannot be understood till the wave propagation mechanism with help of electromagnetic waves (Maxwell's Theory) is not properly understood.

Course Objective:

Basic idea of the course will be to introduce the basic concepts required to understand the formation of wave, characteristics of waves and its propagation, Fiber structure and relativistic mechanics. The course has been built for first year undergraduate students and targeted as general course for all branches of engineering.
6. **Learning outcomes expected from the course:**

At the completion of this Course, student will have the basic skills required to:

a) Understanding of different frame of reference, relativistic mechanics and its application

b) Understanding of basics vector calculus, formation and conduction of wave in different medium with application of Maxwell’s equation

c) Understanding of physical optics and its application in devices

d) Basic understanding of principle of working of LASER and its basic industrial and scientific applications

e) Basic understanding of the structure of optical fiber, propagation mechanism of waves and its loss through the fiber. Industrial application of optical fiber

7. **Details of the syllabi:**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book/ Topics</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Relativistic Mechanics</td>
<td></td>
<td>09</td>
</tr>
<tr>
<td></td>
<td>• Inertial &amp; non-inertial frames,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Galilean transformation equations,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Michelson-Morley experiment, Einstein’s postulates,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lorentz transformation equations,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Length contraction &amp; time dilation,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Addition of velocities, Variation of mass with velocity,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mass energy equivalence.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Electromagnetics</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>• Recapitulation of vector product, Gradient, Divergence &amp; Curl,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Statement and explanation of Gauss divergence &amp; Stokes theorems, useful vector identities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Maxwell’s equations (Integral and differential forms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Equation of continuity, Transverse nature of EM waves,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• EM - wave equation and its propagation characteristics in free-space, Poynting vector.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Interference</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>• Spatial and temporal coherence</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Interference in thin films of uniform thickness and in wedge-shaped film (qualitative),</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Newton’s rings,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• anti reflection and high reflection coatings (qualitative), interference filters(qualitative).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Diffraction
- Single and N-slit diffraction,
- Grating spectra,
- Rayleigh's criterion of resolution,
- Resolving power of grating

### Polarization:
- Polarization by reflection and refraction, Double refraction,
- Nicol prism, Sheet polarizer, Production and analysis of plane,
- circularly and elliptically polarized lights,
- Basic concepts of optical activity, Polarimeter (Half shade).

### Laser:
- Spontaneous and stimulated emission of radiation,
- Einstein’s coefficients, Construction and working of Ruby,
- He-Ne and semiconductor lasers, Important laser applications (qualitative).

### Fiber Optics:
- Fundamental ideas about optical fibers, Types of fibers,
- Acceptance angle and cone, Numerical aperture,
- Propagation mechanism and communication in optical fiber, Attenuation,
- Signal loss in optical fiber and dispersion.

### Holography
- Basic principles of holography, Construction of hologram and wave reconstruction,
- Applications of holography (qualitative).

9. Reference Material:

(ii) A. Beiser, Concepts of Modern Physics, (Mc-Graw Hill).
(iii) Robert Resnick, Introduction to special theory of relativity (Wiley).
(v) Resnick, Halliday and Walker Fundamental of Physics (Wiley).
(vi) David J. Griffith, Introduction to Electrodynamics (Prentice-Hall India).
(vii) S. D. Jain and G. Sahasrabudhe, Engineering Physics (Universities Press).
(viii) K. Rajagopal, Engineering Physics (Prentice-Hall India).
(ix) G. Aruldhas, Engineering Physics (Prentice-Hall India).
10. **Laboratory work:** As per the Engineering Physics Lab Syllabus

11. **Evaluation methodology to be followed:**
The evaluation and assessment plan consists of the following components:

   a. Class attendance and participation in class discussions etc.
   b. Quizzes
   c. Home-works and assignments
   d. Projects
   e. Sessional examinations
   f. 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 questions
     b. Response to other students’ queries
     c. Contribution in discussion and chat sessions

   • Quizzes
     a. Quizzes will be of 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 handwritten form.
     c. The grades and detailed solutions of assignments (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 Mahamaya Technical University.
AS102P: ENGINEERING PHYSICS LAB

Course Objective:
1. To become familiar with various optical devices.
2. To become familiar with usage of data sheet of various components
3. To become familiar with circuit testing
4. To measure and calibrate basic electrical devices

Course Pre requisites:
Basic knowledge of Electricity, Magnetism, Semiconductor Physics and Optics

Course Content:

<table>
<thead>
<tr>
<th>Exp. No.</th>
<th>Experiment</th>
<th>Objective</th>
<th>Expected Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To determine the wavelength of monochromatic light by Newton’s rings</td>
<td>• To visualize coherent sources • Measurement of Wavelength</td>
<td>Should learn to handle travelling microscope and form thin films and measure the wavelength</td>
</tr>
<tr>
<td>2</td>
<td>To determine the wavelength of monochromatic light with the help of Fresnel's biprism.</td>
<td>• Use of optical benches • Measurement of wavelength of monochromatic sources • Mechanism of formation of interference pattern</td>
<td>Should learn formation of interference pattern on the screen and measure wavelength</td>
</tr>
<tr>
<td>3</td>
<td>To determine the specific rotation of cane sugar solution using polarimeter</td>
<td>• To visualize the rotation of plane of vibration of polarized light • Handling of polarimeter</td>
<td>Should learn about rotation of plane of vibration of polarized light and measure its specific rotation</td>
</tr>
<tr>
<td>4</td>
<td>To determine the wavelength of spectral lines of mercury vapour lamp using plane transmission grating.</td>
<td>• Visualization of diffraction pattern • Use of optical spectrometer</td>
<td>Should learn the formation of diffraction pattern on optical spectrometer and measure the wavelength of different spectral lines</td>
</tr>
<tr>
<td>5</td>
<td>Measurement of wavelength of a laser light using single slit diffraction</td>
<td>• Formation of diffraction pattern using laser source • Handling of laser source</td>
<td>Should learn the formation of diffraction pattern on screen and measure the wavelength of spectral line of laser source</td>
</tr>
<tr>
<td>6</td>
<td>Measurement of fiber attenuation and aperture of fiber.</td>
<td>• Handling of optical fiber</td>
<td>Should learn the measurement of attenuation</td>
</tr>
</tbody>
</table>
| 7 | To determine the specific resistance of a given wire using Carey Foster’s bridge | • Using laser source  
• Understanding of balanced bridge condition  
• Use of standard cell | Should learn to calculate specific resistance of given sample |
| 8 | To study the variation of magnetic field along the axis of a current carrying circular coil and then to estimate the radius of the coil. | • Learning Biot-Savart Law  
• Study the variation of magnetic field with distance | Should learn to calculate radius of given coil |
| 9 | To verify Stefan's law by electrical method | • Understanding of black body radiation | Should learn verify Stefan's law |
| 10 | To calibrate the given ammeter and voltmeter by potentiometer | • Understanding of electrical circuits  
• Concept of calibration of electrical devices | Should learn to calibrate given ammeter and voltmeter |
| 11 | To determine E.C.E. of copper using tangent galvanometer. | • Understanding of application tangent galvanometer  
• Understanding of point of magnetic meridian | Should learn to calculate E.C.E of copper |
| 12 | To determine the coefficient of viscosity of a liquid | • Understanding of stream line motion  
• Handling of Poiseuille’s apparatus | Should learn to calculate coefficient of viscosity of liquid. |

**Outcome of the course:**

The students are expected to compare experimental results with theoretical concepts, speculate reasons for discrepancies, and learn from deductive reasoning.
B. Tech. I/II Semester
(Common to all branches)

1. Title of the course: CS101/CS201: Computer Programming

2. Work load per week
   a. Lecture (L): 3 hrs/week  Total Lecture Hours per Semester: 42
   b. Tutorial (T): 1 hrs/week Total Tutorial Hours per Semester: 14
   c. Practicals (P): 2 hrs/week Total Lab Hours per Semester: 28
   c. Total Credits: L+T+P based 5

3. Contents

UNIT I:
Introduction to Computer System: Hardware, Software-system software, & application software; Introduction to Computing Environment; Introduction to Problem solving and notion of algorithm: Flow charting, Pseudo code, corresponding sample C-programme, Testing the code; Number Systems and their conversion: Decimal, Binary, Octal and Hexadecimal representations, bit, byte; Character representation: ASCII, sorting order; System software re-visited: machine language, symbolic language, higher lever languages, what is a compiler, what is an operating system, what is a linker, what is an editor, error handling; Introduction to programme development.

UNIT II:
Structure of a C-program, comments, identifiers; Fundamental Data Types: Character types, Integer, short, long, unsigned, single and double-precision floating point, complex, boolean, constants; Basic Input/Output: printf, formatting, scanf, eof errors; Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associatively, Functions in C: standard function, defining a function, inter-function communication- passing arguments by value, scope rules and global variables; Top-down program development.

UNIT III:
Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch; Program Loops and Iteration: Uses of while-do and for loops, multiple loop variables, assignment operators, using break and continue; Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size

UNIT IV:
Sequential search, Sorting arrays; Strings, Recursion; Text files, file Input/Output - fopen, fread, etc Structures: Purpose and usage of structures, declaring structures, assigning of structures, Pointers to Objects: Pointer and address arithmetic, pointer operations and declarations, using pointers as function arguments

UNIT V:
Familiarization with Linux OS environment: basic OS commands, directory creation, editing, storing and protecting access to files; Open-office; Text files in Indian languages: keyboarding, editing, searching; The
Standard C Preprocessor: Defining and calling macros, utilizing conditional compilation, passing values to the compiler, string handling functions,

**Lecture-wise Breakup**

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture 1</th>
<th>Lecture 2</th>
<th>Lecture 3</th>
<th>Lab Meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week-1</td>
<td>Introduction to Computer System: Hardware, Software-system software, &amp; application software; Introduction to Computing Environment;</td>
<td>Introduction to Problem solving and notion of algorithm: Flow charting, Pseudocode,</td>
<td>corresponding sample C-programme, Testing the code;</td>
<td>Get familiar with OS and C compiler Implement and Test Small Routine in C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number Systems and their conversion: Decimal, Binary and Hexadecimal representations, bit, byte;</td>
<td>Character representation: ASCII, sorting order</td>
<td>Implement and Test Small Routine in C</td>
</tr>
<tr>
<td>Week-2</td>
<td>Number Systems and their conversion: Decimal, Binary and Hexadecimal representations, bit, byte;</td>
<td>Number Systems and their conversion: Decimal, Binary and Hexadecimal representations, bit, byte;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Introduction to programme development; Structure of a C-program, comments, identifiers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week-3</td>
<td>System software revisited: machine language, symbolic language, higher lever languages, what is a compiler, what is an operating system, what is a linker, what is an editor, error handling</td>
<td></td>
<td>Fundamental Data Types: Character types, Integer, short, long, unsigned,</td>
<td>Implement and Test a moderate size Routine in C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week-4</td>
<td>Data Types and Variable single and double-precision floating point, complex, boolean, constants;</td>
<td>Basic Input/Output: printf, formatting, scanf, eof errors;</td>
<td>Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion,</td>
<td>Evaluation of Expression Basic I/O</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week-5</td>
<td>Logical operators, Bit operations, Operator precedence and associatively,</td>
<td>Functions in C: standard function, defining a function,</td>
<td>Inter-function communication-passing arguments by value, scope rules and global variables; Top-down program development</td>
<td>Evaluation of Expression Function</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week-6</td>
<td>if and switch statements,</td>
<td>nesting if and else, restrictions on switch values,</td>
<td>use of break and default with switch;</td>
<td>Iteration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week-7</td>
<td>Repetition structure in C: while-do</td>
<td>Repetition structure in C: for loops</td>
<td>Repetition structure in C: multiple loop variables,</td>
<td>Iteration, Function</td>
</tr>
<tr>
<td>Week</td>
<td>Topic</td>
<td>Subtopics</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>-----------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size</td>
<td>Sequential search, Sorting arrays</td>
<td>Arrays</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Sorting</td>
<td>Strings,</td>
<td>Recursion</td>
<td>Sorting &amp; searching</td>
</tr>
<tr>
<td>10</td>
<td>Recursion</td>
<td>Text files, file input/output, fopen, fread, etc</td>
<td>Structures: Purpose and usage of structures, declaring structures, assigning of structures, Strings, Recursion</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Pointers to Objects: Pointer and address arithmetic, pointer operations and declarations, using pointers as function arguments</td>
<td></td>
<td>Pointers</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Linux OS environment: basic OS commands, directory creation, storing and protecting access to files</td>
<td>editing, open-office</td>
<td>Use of Unix platform (making directory, copy edit and store file, running a sample program already developed)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Text files in Indian languages: keyboarding, Text files in Indian languages: editing, searching</td>
<td>The Standard C Preprocessor: Defining and calling macros, Hindi text document processing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>utilizing conditional compilation, passing values to the compiler, string handling functions,</td>
<td>Std C Library</td>
<td>Std C Library</td>
<td>Macros, Library</td>
</tr>
</tbody>
</table>

**Text Books :**


**For Linux:**

1. LINUX : LEARNING THE ESSENTIALS by K. L. JAMES, published by PHI
2. Guide to UNIX and LINUX by Harley Hahn published by TMH

A few web-links for tutorials/resources:

- [http://www.ee.surrey.ac.uk/Teaching/Unix/](http://www.ee.surrey.ac.uk/Teaching/Unix/)
- [http://www.roseindia.net/linux/tutorial/](http://www.roseindia.net/linux/tutorial/)
B. Tech. I / II Semester

(Common to all branches except Biotechnology and Agricultural Engineering branches)

1. **Title of the course:** ME101/ME201: Engineering Mechanics

2. **Work load per week**
   a. Lecture (L): 3 hrs/week
      Total Lecture Hours per Semester: 42
   b. Tutorials (T): 1 hr/week
      Total Tutorial Hours per Semester: 14
   c. Practicals (P): 2 hrs/week
      Total Lab Hours per Semester: 28
   d. Total Credits: L+T+P based
      5

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

3. **Prerequisites of the course if any:**
The subject requires basic knowledge of mathematics and elementary concept of Vector Calculus. Prior knowledge of Physics is useful but not indispensable

4. **Prerequisite for which next course:**
   Engineering Mechanics is the fundamental subject for many engineering disciplines like Mechanical, Civil, Electrical, Chemical, Aeronautical and Naval Engineering etc. A thorough knowledge of this subject is a prerequisite for pursuing these disciplines as well as for other disciplines in their 1st year course as followed by most of the Indian universities. It lays the foundation for the subjects like Strength of Materials, Machine Design, Theory of Machine, Dynamics of Machines, Structure Mechanics etc.

5. **Why you need to study this course:**
   Engineering Mechanics is both a foundation and provides a framework for most of the branches of engineering. Most of the subjects in areas such as Mechanical, Civil and Aerospace are based upon the subjects of Statics and Dynamics. Even in disciplines such as Electrical Engineering and Mechatronics the course is useful in understanding the working of Electrical/ Robotics devices. An added benefit of studying Engineering Mechanics is that it strengthens problem solving abilities of students.

6. **Learning outcomes expected from the course:**
   1. The ability to understand basic concepts of force systems, motion, work and energy.
   2. The ability to visualize, formulates, analyze and solve engineering problems.
   3. The ability to understand scientific principles and apply them to the practice of engineering problems.
   4. The ability to predict the applications of force and motion while carrying out the design of engineering members.
   5. The ability to design and conduct experiments, as well as to analyze and interpret data.
7. Details of the syllabus:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book/ Topics</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Two Dimensional Concurrent Force Systems:</td>
<td>Text Book 1</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>• Basic concepts</td>
<td>1.1 to 1.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Units</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Force System</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Law of motion</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Moment and couple</td>
<td>4.2, 4.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Vectors - Vectorial representation of forces and moments</td>
<td>2.2, 4.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Vector operations</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Principle of Transmissibility of forces</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Resultant of a force system</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Equilibrium and Equations of Equilibrium</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Equilibrium conditions</td>
<td>5.3, 5.3.1, 5.3.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Free body diagrams</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Determination of reaction</td>
<td>5.3.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Resultant of Two dimensional concurrent forces,</td>
<td>3.6, 5.3.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Applications of concurrent forces</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>II Two Dimensional Non-Concurrent Force Systems:</td>
<td>Text Book 1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>• Basic concepts</td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Varignon’s theorem</td>
<td>4.2.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Transfer of a force to parallel position</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Distributed force system</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Converting force into couple and vice-versa, applications</td>
<td>4.6, 4.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Types of supports and their reactions</td>
<td>Text Book 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Friction:</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Introduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Laws of Coulomb Friction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Equilibrium of Bodies involving Dry-friction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ladder friction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Belt friction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Structure:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Plane truss</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Perfect and imperfect truss</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Assumption in the truss analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Analysis of perfect plane trusses by the method of joints</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Method of section</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>III Centroid and Moment of Inertia:</td>
<td>Text Book 1</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>• Centroid of plane, curve, area, volume and composite bodies</td>
<td>8.4, 8.5.1 to 8, 8.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Moment of inertia of plane area</td>
<td>9.6.1 to 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Parallel Axes Theorem</td>
<td>9.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Perpendicular axes theorems</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mass moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and</td>
<td>10.5.2,10.6.1, 10.6.3,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cone about their Axis of Symmetry</td>
<td>10.6.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Polar moment of inertia</td>
<td>9.5</td>
<td></td>
</tr>
</tbody>
</table>
### IV Kinematics of Rigid Body:
- Introduction
- Plane rectilinear motion of rigid body
- Plane curvilinear Motion of Rigid Body
- Velocity and Acceleration under Translation and Rotational Motion
- Relative velocity

<table>
<thead>
<tr>
<th>Text Book 1</th>
<th>12.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.2, 12.4</td>
<td>13.1</td>
</tr>
<tr>
<td>12.5, 12.5.1, 12.6,</td>
<td>13.5, 13.6</td>
</tr>
<tr>
<td>Text Book 2</td>
<td>12.1 to 12.5</td>
</tr>
</tbody>
</table>

### V Kinetics of rigid body:
- Introduction
- Force, Mass and Acceleration
- Work and Energy
- Impulse and Momentum
- D’Alembert’s Principles and Dynamic Equilibrium

<table>
<thead>
<tr>
<th>Text Book 1</th>
<th>14.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.2,14.3,14.4</td>
<td>15.1 to 15.8</td>
</tr>
<tr>
<td>16.1, 16.2, 16.3</td>
<td>14.5</td>
</tr>
</tbody>
</table>

### Virtual work:
- Virtual displacement and virtual work
- Principle of virtual work
- Stability of equilibrium
- Application of virtual work on frames
- Lifting machines and ladders

| Text Book 1 | 3 |

### 8. Text books to be used:


### 9. Reference materials including web sources

10. [http://nptel.iitm.ac.in/video.php subjectId=112103108](http://nptel.iitm.ac.in/video.php subjectId=112103108)
11. [http://www.youtube.com/watch?v=LG0YzGeAFxk](http://www.youtube.com/watch?v=LG0YzGeAFxk)
12. [http://www.youtube.com/watch?v=eQfGnCHBzc](http://www.youtube.com/watch?v=eQfGnCHBzc)
10. **Laboratory work:**
   As per the EM (Engineering Mechanics Lab) Syllabus

11. **Evaluation methodology to be followed:**
    The evaluation and assessment plan consists of the following components:
    a. Class attendance and participation in class discussions etc.
    b. Quizzes
    c. Home-work and assignments
    d. Projects
    e. Sessional examinations
    f. 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 to class topics and discussion questions
      b. Response to other students’ queries
      c. Contribution to discussion and chat sessions
    - **Quizzes**
      a. Quizzes will be of multiple choice, fill-in-the-blanks or match the columns type.
      b. Quizzes will be held periodically
    - **Home work and assignments**
      a. The assignments/home-work may be of multiple choice or comprehensive type.
      b. They will be available online but submission and be carried out in handwritten form.
      c. The grades and detailed solutions of assignments (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. There will be comprehensive examinations held on-campus (Sessionals) or off-campus (External) on dates fixed by Mahamaya Technical University.

**ME101P//ME201P: Engineering Mechanics Lab**

**Course Objective:**

1. To learn various principles of Mechanics used in our day to day life
2. To analyze the laboratory results (data processing, variability and significance) and the validity of the results
3. To give students the background of experimental techniques and to reinforce instruction in Engineering Mechanics principles.
4. To provide students with exposure to the systematic methods for solving engineering problems.
5. To discuss the basic Mechanical principles underlying modern Engineering Mechanics and to create an understanding of assumptions that are inherent to the solution of Engineering problems.
6. To build the necessary theoretical background for design and construction of foundation systems.

Course Prerequisites:

Basic knowledge of Physics and Mathematics

Course Contents:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Experiment</th>
<th>Objective</th>
<th>Expected Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Polygon law of Co-planer forces (concurrent)</td>
<td>To determine the magnitude and direction of resultant of concurrent force system.</td>
<td>The experiment will help students in understanding the effect of force on engineering elements like hangers, slotted weights, thread, circular table, pulley, etc.</td>
</tr>
<tr>
<td>2</td>
<td>Bell crank lever -Jib crane</td>
<td>To determine magnitude and nature of forces applied on both the arms of bell crank.</td>
<td>Understanding the functioning and designing of cranes.</td>
</tr>
<tr>
<td>3</td>
<td>Support reaction for beam</td>
<td>To find out reaction set up in different types of beams under different types of loading</td>
<td>Information serves as the input to design a beam</td>
</tr>
<tr>
<td>4</td>
<td>Collision of elastic bodies(Law of conservation of momentum)</td>
<td>To study the principle of conservation of momentum in collisions using two bodies.</td>
<td>Exploring concept of collision and transfer of kinetic energy.</td>
</tr>
<tr>
<td>5</td>
<td>Moment of inertia of fly wheel.</td>
<td>The primary objective of this experiment is to find the relationship between the moment of inertia and the radius for discs of the same mass. The secondary objective is to develop a general equation relating the moment of inertia and radius for discs of any mass.</td>
<td>A detailed study of the mass moment of inertia and related concepts.</td>
</tr>
<tr>
<td>6</td>
<td>To study the slider-crank mechanism (2-stroke &amp; 4-stroke I.C. Engine models)</td>
<td>To understand the working of 4-bar slider crank mechanism</td>
<td>Providing knowledge about concept of relative motion of various parts of an I.C. Engine and other such mechanism</td>
</tr>
<tr>
<td>7</td>
<td>Friction experiment(s) on inclined plane</td>
<td>To find the mechanical advantage, velocity ratio and efficiency of a simple screw jack.</td>
<td>Concept of pitch and lead, developing relation between: effort v/s load and efficiency v/s load.</td>
</tr>
<tr>
<td>8</td>
<td>Simple &amp; compound gear-train experiment</td>
<td>To compare simple and compound gear train.</td>
<td>Understanding the concept of power</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>9.</strong></td>
<td>Worm &amp; worm-wheel experiment for load lifting</td>
<td>To find the mechanical advantage, velocity ratio, and efficiency of worm and worm wheel.</td>
<td>Understanding the concept, how the load can lifted at some distance from the point where effort is applied.</td>
</tr>
<tr>
<td><strong>10.</strong></td>
<td>Belt-Pulley experiment</td>
<td>To investigate the relationship belt tensions, angle of wrap and coefficient of friction for flat / V-belt.</td>
<td>Provides a reliable model for belt-driven power transmission, effect of angle of wrap to the power that can be transmitted, compare the power transmitting capability of flat / V-belt.</td>
</tr>
<tr>
<td><strong>11</strong></td>
<td>Experiment on Trusses</td>
<td>To calculate the force applied and its nature in the members under loaded condition.</td>
<td>Differentiating among perfect, deficient and redundant trusses, practical proof of Lami’s theorem, parallelogram law and resolution of force.</td>
</tr>
</tbody>
</table>
| **12** | Statics experiment on equilibrium | To determine that, for a body in Static equilibrium, the following are true:  

- The sum of the moment about any point is zero  
- The sum of forces is zero | Experimental proof of equilibrium condition used in solving problems like truss, beam, friction etc. |
| **13** | Simple/compound pendulum | To measure oscillation period. To compare between experimental and theoretical periods of oscillations | Helps in comparing practical and theoretical values of acceleration due to gravity. |

**Outcome of the course:**

The students are expected to compare experimental results with theoretical concepts, speculate about reasons for discrepancies, and learn from deductive reasoning.

The purposes of experimentation as a subject in the curriculum are many, but perhaps the most important ones are to provide opportunities for the student to:

1. Verify certain theories
2. Become familiar with methods of measurements
3. Organise his/her own work and carry it through systematically and carefully
4. Organise the work of a team
5. Analyse data, assess its reliability and draw conclusions.

**References:**

3. "Advanced Practical Physics for Students", Worsenop & Flint
4. www.physicsclassroom.com
5. www.schoolphysics.co.uk/.../experiments
6. www.physicsforums.com
B. Tech. I/II Semester  
(Common to all branches)

1. Title of the course: EE101/EE201: Electrical Engineering  
2. Work load per week  
   a. Lecture (L): 3 hrs/week  
   b. Tutorial (T): 1 hrs/week  
   c. Practicals (P): 2 hrs/week  
   c. Total Credits: L+T+P based  
   Total Lecture Hours per Semester: 42  
   Total Tutorial Hours per Semester: 14  
   Total Lab Hours per Semester: 28  
   5

Objective & outcome of Learning:  
This is a basic course for all Engineering students of 1st Year. The objective is to make them familiar with basic principles of Electrical Power Engineering, the major equipments used in the system and the corresponding measuring instruments. At the end of this course and engineering graduation will have adequate knowledge of Electrical Power Equipments and how to use them.  
The Lab experiments associated with this course will make him well prepared to use such equipments in the field.

Unit-I  
1. D C Circuit Analysis and Network Theorems:  
   Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, source transformation, unilateral and bilateral elements,  
   Kirchhoff's laws; loop and nodal methods of analysis; star-delta transformation; Network Theorems: Superposition Theorem, Thevenin's Theorem, Maximum Power Transfer Theorem (simple numerical problems with resistive element)  
   7

Unit-II  
2. Steady-State Analysis of Single Phase AC Circuits:  
   AC Fundamentals: Sinusoidal, square and triangular waveforms-average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current, concept of impedance, analysis of series, parallel and series-parallel RLC Circuits: apparent, active & reactive powers, power factor, resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems).  
   8

Unit-III  
3. Three Phase AC Circuits:  
   Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations, three-phase power and its measurement (simple numerical problems).  
   4
4. **Measuring Instruments:**

Types of instruments, construction and working principles of PMMC and moving iron type voltmeters & ammeters, single phase dynamometer wattmeter and induction type energy meter, block diagram of multi-meter & megger.

Unit-IV

5. **Magnetic Circuit:**

Magnetic circuit concepts, analogy between electric & magnetic circuits with DC excitations, magnetic circuit calculations.

6. **Introduction to Power System:**

General layout of electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid (elementary treatment only).

Unit-V

7. **Single Phase Transformer:**

Principle of operation, construction, e.m.f. equation, equivalent circuit, power losses, efficiency (simple numerical problems), introduction to auto transformer.

8. **Electrical Machines:**

- **DC machines:** Construction, e.m.f. equation of generator and torque equation of motor. Types and DG machines, characteristics and applications of dc motors (simple numerical problems).
- **Three Phase Induction Motor:** Constructions types, rotating magnetic field. Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).
- **Single Phase Induction motor:** Principle of operation phase splitting methods of starting, applications.
- **Three Phase Synchronous Machines:** Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1. V. Del Toro, “Principles of Electrical Engineering” Prentice Hall International

Reference:

1. Edward Hughes, “Electrical Technology” Longman

NPTEL Course on Electrical Technologies
List of Experiments

Note: A minimum of 10 experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study the improvement of power factor using capacitor.
4. Study the phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3-phase circuit by two wattmeter method and determination of its power factor.
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer.
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. To study running and speed reversal of a three phase induction motor and record speed in both directions.
10. To measure energy by a single phase energy meter and determine the error.
11. To perform the O.C. & S.C. Test on 1-phase Transformer and establish equivalent circuit and full load efficiency.
12. Determination of Insulation resistance of transformer/motor/cable with the help of Megger.
B. Tech. I / II Semester
(Common to all branches)

1. **Title of the course**: EC101/201: Electronics Engineering

2. **Work load per week**
   - **Lecture (L)**: 3 hrs/week  
     Total Lecture Hours per Semester: 42
   - **Tutorials (T)**: 1 hrs/week  
     Total Tutorial Hours per Semester: 14
   - **Practicals (P)**: 2 hrs/week  
     Total Lab Hours per Semester: 28
   
   - **Total Credits**: L+T+P based  
     5

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

3. **Prerequisites of the course**: As a prerequisite for this course on Basic Electronics, knowledge of general principles of electricity, magnetism and semiconductor physics is assumed.

4. **Prerequisite for which next course**: This course is prerequisite for
   - **EEC-301 Fundamental of Electronic Devices**
   - **EEC-401 Electronic Circuits**
   - **EEC-404 Electronic Measurements and Instrumentation**

5. **Why you need to study this course**: We are living in an age of Information Technology. Electronics is at the very foundation of the Information and Computer Age. The giant strides that we have made in the areas of Communications and Computers are possible only because of the great successes that we have achieved in the field of Electronics.

   It is sometimes unbelievable, how many electronics gadgets that we carry these days in our person – Digital Wrist-watch, Calculator, Cell-phone, Digital Diary or a PDA, Digital Camera or a Video camera, etc. The different type of Electronic equipments that has invaded our offices and homes these days is also mind boggling.

   Electronics has made deep impact in several vital areas such as health care, medical diagnosis and treatment, Air and space travels, Automobiles, etc. In short, the technological developments of several countries of the globe are directly related to their strengths in electronics design, manufacture, products and services.

**Course Objective:**

Basic idea of the course will be to introduce the basic concepts required to understand the electronic devices, circuits and measuring instruments. The course has been built for first year undergraduate students and targeted as general course for all branches of engineering.
6. Learning outcomes expected from the course:

At the completion of this Course, student will have the basic skills required to:

a) Identify schematic symbols and understand the working principles of electronic devices e.g. Diode, Zener Diode, LED, BJT, JFET and MOSFET etc.

b) Understand the working principles of electronic circuits e.g. Rectifiers, Clipper, Clamper, Filters, Amplifiers and Operational Amplifiers etc. also understand methods to analyse and characterize these circuits.

c) Understand the functioning and purposes of Power Supplies, Test and Measuring equipments such as Multimeters, CROs and Function generators etc.

d) Be able to rig up and test small electronics circuits.

7. Details of the syllabi:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book/Topics</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction to Electronics</td>
<td>Text Book 1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Diode Fundamentals</td>
<td>2.2, 2.4, 2.6-2.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Semiconductor materials (Intrinsic and extrinsic)</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The Unbiased Diode</td>
<td>2.9-2.14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Forward Bias and Reverse Bias, Breakdown, Energy Levels ,The Energy Hill, Barrier Potential and Temperature</td>
<td>2.15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Reverse-Biased Diode</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Basic Ideas</td>
<td>3.2-3.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The Ideal Diode, The Second and Third Approximation</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Up-Down Circuit Analysis</td>
<td>3.8-3.10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Bulk Resistance, DC Resistance of a Diode, Load Lines</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diode Circuits</td>
<td>Text Book 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The Half-Wave, Full-Wave and Bridge Rectifiers</td>
<td>4.1, 4.3, 4.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The Choke-Input Filter and the Capacitor-Input Filter</td>
<td>4.5, 4.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Peak Inverse Voltage and Surge Current</td>
<td>4.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Clippers and Limiters</td>
<td>4.10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Clammers</td>
<td>4.11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Voltage Multipliers</td>
<td>4.12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Special purpose diodes</td>
<td>Text Book 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The Zener Diode, The Loaded Zener Regulator, Second Approximation of a Zener Diode</td>
<td>5.1-5.3</td>
<td></td>
</tr>
</tbody>
</table>
- Optoelectronic Devices
- Schottky Diode
- Varactor Diode

<table>
<thead>
<tr>
<th>II Bipolar Junction Transistors (BJTs)</th>
<th>Text Book 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transistor Fundamentals</strong></td>
<td></td>
</tr>
<tr>
<td>- The Unbiased Transistor, the Biased Transistor</td>
<td>6.1, 6.2</td>
</tr>
<tr>
<td>- Transistor Currents</td>
<td>6.3</td>
</tr>
<tr>
<td>- The CE Connection</td>
<td>6.4</td>
</tr>
<tr>
<td>- Base Curve &amp; Collector Curves</td>
<td>6.5, 6.6</td>
</tr>
<tr>
<td>- Transistor Approximations</td>
<td>6.7</td>
</tr>
<tr>
<td>- Variations in current Gain</td>
<td>7.1</td>
</tr>
<tr>
<td>- The Load Line</td>
<td>7.2</td>
</tr>
<tr>
<td>- The Operating Point</td>
<td>7.3</td>
</tr>
<tr>
<td>- Recognizing Saturation</td>
<td>7.4</td>
</tr>
<tr>
<td>- The transistor Switch</td>
<td>7.5</td>
</tr>
<tr>
<td>- Emitter Bias</td>
<td>7.6</td>
</tr>
<tr>
<td>- Voltage-Divider bias, Accurate VDB Analysis, VDB Load Line and Q Point</td>
<td>8.1-8.3</td>
</tr>
<tr>
<td>- Other types of Bias</td>
<td>8.5</td>
</tr>
<tr>
<td><strong>Transistor Circuits</strong></td>
<td></td>
</tr>
<tr>
<td>- Base-Biased Amplifier</td>
<td></td>
</tr>
<tr>
<td>- Emitter-Biased Amplifier</td>
<td></td>
</tr>
<tr>
<td>- Small-Signal Operation</td>
<td></td>
</tr>
<tr>
<td>- AC Beta</td>
<td></td>
</tr>
<tr>
<td>- Resistance of the Emitter Diode</td>
<td></td>
</tr>
<tr>
<td>- Analyzing an Amplifier</td>
<td></td>
</tr>
<tr>
<td>- Voltage Gain</td>
<td></td>
</tr>
<tr>
<td>- The Loading Effect of Input Impedance</td>
<td></td>
</tr>
<tr>
<td>- CC amplifier</td>
<td></td>
</tr>
<tr>
<td>- Output impedance</td>
<td></td>
</tr>
</tbody>
</table>
### III Field Effect Devices

**JFET**
- Basic Ideas
- Drain Curves
- The Transconductance Curve
- Biasing in the Ohmic Region and Active Region
- Transconductance
- JFET Amplifiers
- The JFET Analog Switch
- Other JFET Applications

**MOSFET**
- The Depletion –Mode MOSFET
- D-MOSFET Curves
- Depletion-Mode MOSFET Amplifier
- The Enhancement-Mode MOSFET
- The Ohmic Region
- CMOS

### IV Operational Amplifiers

**Introduction to Op Amps**
- The 741Op Amp
- Inverting Amplifier and noninverting Amplifier
- Two Op-Amp Applications
- Four Types of Negative Feedback

**Op-Amp Circuits**

#### Linear Op-Amp Circuits
- Inverting-Amplifier Circuits
- Noninverting-Amplifier Circuits
- Summing amplifier circuits

#### Nonlinear Op-Amp Circuits

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cascading CE and CC</td>
<td>11.2</td>
</tr>
<tr>
<td>Field Effect Devices</td>
<td>Text Book 1</td>
</tr>
<tr>
<td>JFET</td>
<td>13.1</td>
</tr>
<tr>
<td>Basic Ideas</td>
<td>13.2</td>
</tr>
<tr>
<td>Drain Curves</td>
<td>13.3</td>
</tr>
<tr>
<td>The Transconductance Curve</td>
<td>13.4, 13.5</td>
</tr>
<tr>
<td>Biasing in the Ohmic Region and Active Region</td>
<td>13.6</td>
</tr>
<tr>
<td>Transconductance</td>
<td>13.7</td>
</tr>
<tr>
<td>JFET Amplifiers</td>
<td>13.8</td>
</tr>
<tr>
<td>The JFET Analog Switch</td>
<td>13.9</td>
</tr>
<tr>
<td>Other JFET Applications</td>
<td></td>
</tr>
<tr>
<td>MOSFET</td>
<td>Text Book 1</td>
</tr>
<tr>
<td>The Depletion –Mode MOSFET</td>
<td>14.1</td>
</tr>
<tr>
<td>D-MOSFET Curves</td>
<td>14.2</td>
</tr>
<tr>
<td>Depletion-Mode MOSFET Amplifier</td>
<td>14.3</td>
</tr>
<tr>
<td>The Enhancement-Mode MOSFET</td>
<td>14.4</td>
</tr>
<tr>
<td>The Ohmic Region</td>
<td>14.5</td>
</tr>
<tr>
<td>CMOS</td>
<td>14.7</td>
</tr>
<tr>
<td>Text Book 1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

#### Nonlinear Op-Amp Circuits

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Op-Amp Circuits</td>
<td></td>
</tr>
<tr>
<td>Inverting-Amplifier Circuits</td>
<td>18.1, 18.2</td>
</tr>
<tr>
<td>Noninverting-Amplifier Circuits</td>
<td>18.3, 18.4</td>
</tr>
<tr>
<td>Summing amplifier circuits</td>
<td>18.5</td>
</tr>
<tr>
<td>Four Types of Negative Feedback</td>
<td>19.1</td>
</tr>
</tbody>
</table>

#### Text Book 1

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear Op-Amp Circuits</td>
<td></td>
</tr>
<tr>
<td>Inverting-Amplifier Circuits</td>
<td>20.1</td>
</tr>
<tr>
<td>Noninverting-Amplifier Circuits</td>
<td>20.2</td>
</tr>
<tr>
<td>Summing amplifier circuits</td>
<td>20.6</td>
</tr>
</tbody>
</table>
- Comparator with zero and nonzero reference
- Integrator
- Differentiator

### V Electronic Instrumentation and Measurements

#### Digital Voltmeters

- Digital Voltmeter Systems
- Digital Multimeters

#### Cathode-ray Oscilloscopes

- Cathode-Ray tube
- Deflection Amplifier
- Waveform Display
- Oscilloscope Time Base
- Oscilloscope Controls
- Measurement of Voltage, Frequency, and Phase

#### Signal Generator

- Function Generators

#### Laboratory Power Supplies

- Unregulated DC Power Supplies
- Power Supply Performance and Specifications
- DC Power Supply Use

<table>
<thead>
<tr>
<th>8. Text books:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>9. Reference Material:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Lecture Series on Basic Electronics by Prof. T.S.Natarajan, Department of physics, IIT Madras <a href="http://nptel.iitm.ac.in">http://nptel.iitm.ac.in</a></td>
</tr>
</tbody>
</table>
3. Basic Electronics (Video content) by Prof. Chitralekha Mahanta, IIT Guwahati
   http://nptel.iitm.ac.in/courses/

4. Basic Electronics (Web Content) by Prof. Pramod Agarwal, IIT Roorkee
   http://nptel.iitm.ac.in/courses/

10. Laboratory work: As per the EC (Electronics Engineering Lab) Syllabus

11. Evaluation methodology to be followed:
The evaluation and assessment plan consists of the following components:
   a. Class attendance and participation in class discussions etc.
   b. Quizzes
   c. Home-works and assignments
   d. Projects
   e. Sessional examinations
   f. 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 questions
  b. Response to other students' queries
  c. Contribution in discussion and chat sessions

- Quizzes
  a. Quizzes will be of 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 handwritten form.
  c. The grades and detailed solutions of assignments (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 Mahamaya Technical University.
# EC101P/201P: ELECTRONICS ENGINEERING LAB

**Course Objective:**
1. To become familiar with various electronic devices.
2. To become familiar with usage of data sheet of various components.
3. To become familiar with circuit testing.
4. To learn to use common electronic measuring instruments.
5. To learn electronic design aids.

**Course Pre requisites:**
Basic knowledge of Electricity, Magnetism, Semiconductor Physics

**Course Content:**

<table>
<thead>
<tr>
<th>Exp. No.</th>
<th>Experiment</th>
<th>Objective</th>
<th>Expected Outcome</th>
</tr>
</thead>
</table>
| 1       | Study of Digital Multimeters     | 1. Measurement of AC and DC voltages  
2. Measurement of Current  
3. Measurement of resistance  
4. Measurement of parameters of diodes and transistors. | To be ready to carry out the necessary measurements with the Multimeter.          |
| 2       | Study of Cathode Ray Oscilloscope | 1. To study of controls of CRO  
2. To measure amplitude, time period and frequency of time varying signals.  
3. To study Lissajous figures to know about the phase difference between the two signals and the ratio of their frequencies. | To get familiarized with oscilloscope usage for different types of measurements. |
| 3       | Study of Function generator      | 1. Study of controls of Function generator  
2. To configure the function generator to output a 10Vpp, 1 Khz sinusoidal wave | Should be able to learn operational controls of function generator so that it can be configured for the desired output. |
| 4       | Study of Passive Components      | 1. To study color codes for value, tolerance and wattage.                 | Should be able to  
• Identify the component  
• Calculate and measure the value of the component  
• Compare the calculated values with measured values. |
| 5       | Study of other useful components | 1. To study various types of components used in electronics circuitry and systems | Should be able to  
• Datasheet of the components  
• Make selection of desired components for designing a circuit |
| 6-9 | Study of Semiconductor devices  
- Diodes  
- BJT  
- FET  
- OP Amp | 1. To study the data sheet to understand specifications of – Diodes, BJT, FET, OPAMP  
2. To build and test clipper and clamper using diode.  
4. To build and test BJT as switch.  
3. To build and test OPAMP Adder and Subtractor. | Should be able to  
- Identify devices and understand their behavior.  
- Should be able to use them on Breadboard to build small circuits like rectifiers, switches, amplifiers, power supplies etc. |
| 10 | Study of PSPICE | 1. Simulation and analysis of common emitter amplifier using SPICE. | To learn about electronic design automation tools. |
| 11 | Study of soldering techniques and Soldering practice | 1. To build and test Half and Full wave rectifier on general purpose PCB. | To learn to solder electronic components on PCB and test the circuit |

**Outcome of the course:**
The students are expected to compare experimental results with theoretical concepts, speculate reasons for discrepancies, and learn from deductive reasoning.

**References:**
2. Virtual Lab Website “http://www.vlab.co.in/”
B Tech I / II Semester
(Common to all branches)

1. Title of the Course: 
   AS103/AS203: Engineering Chemistry

2. Work load per week
   a. Lecture (L) 3 hrs / week 
      Total Lectures hrs per Sem - 42
   b. Practical (P) 2hrs / week 
      Total Lab hrs per Sem - 24
   c. Total Credits L + P 
      4
   d. One Credit is defined as one Lecture load per week and two hrs of Self study to be connected with tutorial, practical work, book & assignments.

3. Pre requisites of the Course:
   a. Basic concepts of chemistry at +2 level.
   b. Understanding of different states of matter, structure of atom, chemical bonding.
   c. General properties of elements and periodicity, Elementary knowledge of thermodynamics, chemical reactivity and chemical equilibrium
   d. Elementary knowledge of reaction rates, catalysis
   e. Simple Organic compounds, their structure and reactions

4. Pre requisites of which next course:
   Chemical Science courses for different engineering and Technology disciplines requiring knowledge of advanced chemical systems, procedures and protocols

5. Why you need to study this course
   Chemistry is a central science linking physics, mathematics and computers on one hand and mechanical, electrical, chemical engineering, biotechnology, biomedical engineering, neural networks and other fundamental and applied disciplines on the other hand. Rapid progress in the subject has to keep pace with teaching of chemistry to all students particularly to budding engineers who will have to deal with some chemical or the other or chemical processes or reactions during their later career. Chemistry is also involved in understanding human body, medicine and biological reactions in the living system. Courses in mechanical engineering, energy efficiency, power sector, biotechnology, biochemical and chemical engineering, biomedical engineering, tissue engineering would be requiring more chemistry content and therefore such students can take another
chemistry elective course. This will help them in becoming successful practicing
engineers besides providing essential ground work to pursue advanced studies in their
respective engineering fields.

Chemistry I course for undergraduate engineering students is designed to strengthen the
fundamentals of chemistry so that they can build their own interface of applied chemical concepts
with their industrial/engineering application in their chosen branch of engineering.

Course objective; The course is stipulated to be at a general level for all engineering disciplines
with view to

- To understand fundamentals of applied chemistry (inorganic, organic and physical
  chemistry) required for engineering education and practice

- To equip future engineers with sufficient general chemistry information to be able to
  identify required chemical measures to be adopted during their professional career
  especially applications of traditional and novel engineering materials

6. Learning Outcome from this Course

- Understand matter and its constituents as transition from atoms to molecules to
  Engineering materials

- Understand methods of separation, analysis and purification of compounds and materials

- Understand the structure and stereostructure of molecules and their representation and
  chirality

- Understand essentials of modern tools for analysis of compounds by chemical, physical
  and spectroscopic techniques (elementary level).

- Understand Unit Processes for obtaining organic compounds at an industrial scale and learn
  the ways to adopt and modify reaction conditions.

- Able to treat and analyze waste water and potable water and understand the mechanism of
  corrosion on various material used in industry.
### 7. Contents of Chemistry Course:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Books</th>
<th>Lecturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction of Engineering Chemistry</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Atoms to molecules to materials for Engineers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atoms combines to give molecules and how molecules aggregate o give materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recapitulation of salient feature OF valence bond theory ,Hybridization, sigma and pi bonds shape of the simple inorganic compounds based upon concepts of hybridization and to illustrate planar, tetrahedral square planer, and octahedral geometries.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Molecular orbital theory and its application to form homo (H2 N2 &amp;O2) and hetero (HF,NO) diatomic molecules.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Structure and stereo structure of molecules</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Representing three dimensional structure of organic molecules including Conformations, Newman, Sawhorse,Fischer, projections wedge and dash structural representation, equivalence of structural representations</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chirality, optical activity and isomerism , compounds containing one and two chiral carbons , enantiomers, di stereo isomers, meso compounds, no. of chiral atoms and optical isomers, Dynamic stereochemistry , concepts of regiochemistry, stereo selectivity, Stereo specificity and enantiomeric excess R&amp;S nomenclature.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Geometrical isomerism in simple acyclic and cyclic molecules, E &amp; Z nomenclature.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Materials and their Characterization</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>III</td>
<td>Stability and Reactivity of Molecules : Unit processes in organic chemistry</td>
<td>1,2</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>------------------------------------------------------------------------</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reactivity of Molecules : Electron displacement effects – inductive, electromeric, resonance and hyper conjugation, Reactive sites in molecules - functional groups.</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reactions Dynamics: Chemical kinetics, Order and molecularity, zero, first and second order reactions, pseudo first order reaction, temperature dependence of reaction rates, Catalysis and some industrially important catalytic reactions.</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reaction Mechanism: Fission of a covalent Bond, types of reactions – nucleophilic ( SN1 &amp; SN2, SNI, SNAr) and electrophilic substitution reactions ( Nitration, Sulphonation, Halogenation, and Friedel Crafts reaction ) and their mechanism, regio and Stereochemistry of involved reactions</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Water and its treatment : Alkalinity of water, estimation of alkalinity, Hard and soft water, hardness- units, determination of hardness by complexometric Titration, Removal of hardness of water- Zeolite , ion exchange process, Boiler Feed water, descaling of</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
boilers desalination of brackish water, Reverse osmosis, potable water,

### V

**Some materials of Industrial importance:**

Polymers and Polymerization (ionic, anionic and free radical induced), Properties of polymers, Number average and Weight average molecular weights, characterization of polymer samples, polymer blends, Stereo structures of polymers, Dendrimers, Some examples of common polymers used in Industry, Natural and Synthetic rubber, Silicones, Composites, Adhesives, Conducting polymers, Biodegradable polymers.

Metallic corrosion and its prevention, electrolysis, Industrial electrolytic processes-(aluminium). Fuel cells and batteries.

**Control of friction** – Oils, fats and lubricants, Soaps and detergents

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

### References:

**Recommended Reference Books:**

Students are encouraged to use available library resources, electronic media and internet information for further understanding of the subject. The following books are suggested as reference works for teachers/students


CHEMISTRY LABORATORY  AS103P/AS203P

The following representative experiments have been suggested for chemistry laboratory:

1. Introduction to safety and working in a chemical laboratory
2. Determination of hardness of water by titration with standard EDTA solution
3. Determination of iodide content in iodized salt through iodometric titration with sodium thiosulphate
4. Determination of Alkalinity in water sample.
5. Determination of rate constant for acid catalyzed hydrolysis of ethyl acetate through titration
6. Determination of glycine content in a sample of amino acid
7. Synthesis of benzimidazole and record of its UV spectrum
8. Comparison of viscosity and surface tension of two liquids and their variation on addition of surfactants and soap of known concentration
9. Determination of neutralization of a lubricant oil or iodine number of an unsaturated oil.
10. Detection of functional groups in an organic compound by wet tests
11. Identification of an organic compound
12. Synthesis of p-nitroacetanilide from acetanilide

References:

5. Saltcomindia.gov.in./NIDCCP- EstimatContent.html
1. Title of the course: ME102/ ME202: Manufacturing Practices

2. Work load per week
   a. Lecture (L): 2 hrs/week
   b. Tutorial (T): 1
   c. Practical’s (P): 2 hrs/week
   d. Total Credits: L+T+P based

   Total Lecture Hours per Semester: 28
   Total Tutorial Hours per Semester: 14
   Total Lab Hours per Semester: 28
   4

3. Prerequisites of the course if any:
The subject requires basic knowledge of mathematics and measuring equipments

4. Prerequisite for which next course:
   Manufacturing Practices is the fundamental subject for Manufacturing Science, Production Technology, Advance Machining etc.

5. Why you need to study this course.
The course will help in understanding various operations of manufacturing processes

6. Course Objectives:
   1. To become familiar with various manufacturing processes.
   2. To become familiar with usage of various manufacturing instruments.
   3. To become familiar with various operations.
   4. To learn to use instruments with safety precautions.

7. Details of the syllabus: (Lectures)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Topic</th>
<th>Text Book/ Topics</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Carpentry Shop</td>
<td>Text Book 1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>• Basic concepts</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Types of woods and their properties</td>
<td>10.2, 10.3, 10.4, 10.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Seasoning of wood</td>
<td>10.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Carpenter tools</td>
<td>10.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Carpenter processes</td>
<td>10.17-10.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Carpenter joints</td>
<td>10.26</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fitting Bench Working Shop</td>
<td>Text Book 1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>• Introduction</td>
<td>14.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Voices</td>
<td>14.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fitting Processes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Black Smithy Shop</td>
<td>Text Book 1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>• Introduction</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Forging Material</td>
<td>8.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Heating devices</td>
<td>8.3</td>
<td></td>
</tr>
</tbody>
</table>
8. Details of the syllabus: ME102P/ME202P (LAB)

<table>
<thead>
<tr>
<th>Ex. No.</th>
<th>Experiment</th>
<th>Objective</th>
<th>Expected Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carpentry Shop</td>
<td>1. To understand different types of woods and their properties.</td>
<td>To perform different types of operations on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Study various tools &amp; equipments used in carpentry.</td>
<td>woods (such as sawing, joint making etc).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. To prepare half-lap corner joint, Mortise &amp; tenon joints.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Simple exercise on wood working lathe.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fitting Bench Working Shop</td>
<td>1. Introduction to fitting tools, Study of tools &amp; operations.</td>
<td>To get familiarized with various Fitting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Simple exercises involving fitting work.</td>
<td>operations.</td>
</tr>
<tr>
<td>Number</td>
<td>Shop Name</td>
<td>Key Elements</td>
<td>Additional Notes</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
</tbody>
</table>
| 3      | Black Smithy Shop  | 1. Introduction and demonstration of various blacksmith operations.  
|        |                    | 2. To learn upsetting, drawing down, punching, bending.  
|        |                    | 3. To perform operation for making L-Shaped nail.  
|        |                    | To be able to learn Forming operations (such as bending, upsetting and drawing). |
| 4      | Welding Shop       | 1. Introduction to welding and welding equipments.  
|        |                    | 2. To learn operations of Gas welding & Arc welding.  
|        |                    | 3. To learn Simple butt and Lap welded joints.  
|        |                    | 4. To learn Oxy-acetylene flame welding and cutting.  
|        |                    | To get familiarized with Electric arc welding and Oxy-acetylene gas welding. |
| 5      | Sheet Metal Shop   | 1. Introduction to tools and operations in sheet metal shop.  
|        |                    | 2. Fabrication of tool-box, tray, electric panel box etc.  
|        |                    | 3. Making Funnel complete with ’soldering’.  
|        |                    | To be able to learn various sheet metal operations. |
| 6      | Machine Shop       | 1. Introduction to Lathe machine and its various operations.  
|        |                    | 2. To perform Plane turning, Step turning, Taper turning & Threading.  
|        |                    | 3. Introduction of Single point cutting tool grinding.  
|        |                    | To get familiarized with Lathe machine and various machining operations. |
| 7      | Foundry Shop       | 1. Introduction to foundry tools.  
|        |                    | 2. To study different types of molding sands.  
|        |                    | 3. Mould making with the use of a core and Casting.  
|        |                    | To get familiarized with various Foundry techniques. |

9. **Text books to be used:**  

10. **References:**  
    3. W. Chapman, "Workshop technology",  
    4. [http://freevideolectures.com/Course/2369/Manufacturing-Processes-II](http://freevideolectures.com/Course/2369/Manufacturing-Processes-II)  
    5. [http://freevideolectures.com/Course/2368/Manufacturing-Processes-I](http://freevideolectures.com/Course/2368/Manufacturing-Processes-I)  
    7. [http://nptel.iitm.ac.in/video.php?subjectId=112105126](http://nptel.iitm.ac.in/video.php?subjectId=112105126)  

11. **Evaluation methodology to be followed:**  
    The evaluation and assessment plan consists of the following components:  
    a. Class attendance and participation in class discussions etc.  
    b. Quizzes  
    c. Projects  
    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 to class topics and discussion questions
  - b. Response to other students’ queries
  - c. Contribution to discussion and chat sessions

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

- **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. There will be comprehensive practical examinations held on-campus (Sessionals) on dates fixed by Mahamaya Technical University.
B. Tech. I / II Semester
(For CS, EC, EE, EN, IC, EI, IT, TE and BT branches)

1. Title of the course: AS104/AS204: Introduction to Bio Science

2. Work load per week
   
   a. Lecture (L): 3 hrs/week
   Total Lecture Hours per Semester: 42
   
   b. Tutorials (T): 0
   Total Tutorial Hours per Semester: 0
   
   c. Practicals (P): 0
   Total Lab Hours per Semester: 0
   
   d. Total Credits: L+T+P based 3
   
   e. One credit is defined as one lecture load per week and two hours of self-study to be connected with tutorial, practical work book and assignments.

3. Prerequisites of the course: As a prerequisite for this course on Living System, Cellular Structure, knowledge of general principles of Metabolism and Genetic Engineering is assumed.

4. Prerequisite for which next course: This course is prerequisite for
   
   • BT-302 Microbiology & Cell Biology.
   
   • BT-303 Molecular Dynamics & Bioenergetics.
   
   • BT-501 Genetic Engineering.

5. Why you need to study this course: We are living in an age of Science & Technology. Present Scenario witnesses the interdisciplinary approach in every walk of life. Even subject like psychology, Public administration claim themselves to be science on the ground that it avail the services of scientific methods and experimental research to attain conclusion. Similar is the case of Biological Sciences. Its subject matter is quite vast as it encompasses fields like genomics, proteomics, metabolomics, physics to understand the orientation of macromolecules and even economics to establish the strong roots of Biotechnology as industry, because biotechnology cuts across international boundaries and affects public and private interest and influences on international relations, focussing on agriculture, environmental issues, low commerce and biological warfare and in order to aid scientific community. It becomes necessary to demarcate the boundary of this discipline. In every aspects of Life, The role of Biosciences is quire inevitable. In the modern era, Biotechnology has become a boon to the mankind by way of changing the lives. Some of the considerable results are: Genetically modified food, High yield varieties, Pest and disease protection, Less erosion, Human Application, Transgenic animals / Plants, Xenobiotics, Health care & diagnosis etc.

Course Objective:

Basic idea of the course will be to introduce the basic concepts required to understand the Living Systems, Cellular Structure & Metabolism and Concept of Genetic Engineering. The course has been built for first year undergraduate students and targeted as general course for all branches of engineering.
6. **Learning outcomes expected from the course:**

At the completion of this Course, student will have the basic skills required to:

a) Understand the potential of engineering Living systems.

b) Understand key common features of living system, cellular structure & function.

c) Have a basic understanding of cellular metabolism, Physiological processes and Metabolic engineering.

d) Understand the basics of Cell division, Gene control and expression emphasizing on systems more commonly used in biotechnology.

e) Have a basic knowledge of what is feasible with genetic engineering, key underlying technology.

**Aims:**

This course will provide a basic grounding in key aspects of molecular bioscience with an emphasis on bioscience engineering:

- Common features of living systems
- Cellular structure, Cell division & metabolism.
- Metabolic engineering.
- Basics of genetic engineering.
- Genome sequencing, genomics and key computational methods.
- Human Reproduction, Sex and Sexuality.
### 7. Details of the syllabi:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book/ Topics</th>
<th>Lectures</th>
</tr>
</thead>
</table>
| I    | **Introduction to Bioscience**  
**Cell Structure & Function**  
- The development of cell theory  
- Cell Size  
- The structure of Cellular Membranes  
- Organelles composed of membranes  
- Plasma Membrane  
- Endoplasmic Reticulum  
- Golgi Apparatus  
- Lysosomes  
- Peroxisomes  
- Vacuoles & Vesicles  
- Nuclear Membrane  
**Metabolic Engineering**  
- Biochemical Pathways-Cellular Respiration  
- An overview of Aerobic cellular Respiration  
- Glycolysis  
- The Crebs Cycle  
- The Electron Transport System (ETS) | Text Book 1  
4.1,  
4.2  
4.3  
4.4  
4.4a  
4.4b  
4.4c  
4.4d  
4.4e  
4.4f  
4.4g | 10 |
| II   | **Molecular Biology , Genomics & Proteomics**  
**DNA and RNA : The Molecular Basis**  
- DNA and the Importance of Proteins  
- DNA Structure and Function  
- DNA Structure  
- Base pairing in DNA Replication  
- The repair of genetic information  
- The DNA code | Text Book 1  
8.0  
8.1  
8.2  
8.2a  
8.2b  
8.2c  
8.2d | 8 |
<table>
<thead>
<tr>
<th>Section</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNA Structure and Function</td>
<td></td>
</tr>
<tr>
<td>Synthetic Biology</td>
<td>Protein Synthesis : Central dogma</td>
</tr>
<tr>
<td></td>
<td>Step-1 : Transcription --- Making RNA</td>
</tr>
<tr>
<td></td>
<td>Step -2 : Translation--Making Protein</td>
</tr>
<tr>
<td>The Control of Protein Synthesis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Controlling Protein Quantity</td>
</tr>
<tr>
<td></td>
<td>Controlling Protein Quality</td>
</tr>
<tr>
<td>III</td>
<td>Cell Division - Proliferation</td>
</tr>
<tr>
<td>Cell Division – an overview</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asexual Reproduction</td>
</tr>
<tr>
<td></td>
<td>Sexual Reproduction</td>
</tr>
<tr>
<td>The Cell Cycle and Mitosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The G1 stage of Interphase</td>
</tr>
<tr>
<td></td>
<td>The S stage of Interphase</td>
</tr>
<tr>
<td></td>
<td>The G2 stage of Interphase</td>
</tr>
<tr>
<td>Mitosis : Cell Replication</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prophase</td>
</tr>
<tr>
<td></td>
<td>Metaphase</td>
</tr>
<tr>
<td></td>
<td>Anaphase</td>
</tr>
<tr>
<td></td>
<td>Telophase</td>
</tr>
<tr>
<td></td>
<td>Cytokinesis</td>
</tr>
<tr>
<td>Controlling Mitosis</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Genetic Engineering</td>
</tr>
<tr>
<td>Introduction to Genetic Engineering</td>
<td></td>
</tr>
</tbody>
</table>

Text Book 1, 8.3

8.4
8.4a
8.4b
8.5
8.5a
8.5b

Text Book 1
9.1
9.1a
9.1b
9.2
9.2a
9.2b
9.2c
Text Book 1,9.3
9.3a
9.3b
9.3c
9.3d
9.3e
9.4

Text Book 1
11.1

8
<table>
<thead>
<tr>
<th>DNA Fingerprinting</th>
<th>18.1, 18.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNA Fingerprinting Technique</td>
<td>18.3, 18.4</td>
</tr>
<tr>
<td>DNA Fingerprinting Application</td>
<td>18.5</td>
</tr>
<tr>
<td>Polymerase Chain Reaction</td>
<td>19.1</td>
</tr>
<tr>
<td>Electrophoresis</td>
<td></td>
</tr>
</tbody>
</table>

**Gene Sequencing**

- Gene Sequencing and Human Genome Project
  - Human Genome Project Techniques
  - Human Genome Project Application
- Cloning Genes
- Genetically modified Food
- Gene Therapy

<table>
<thead>
<tr>
<th>Stem Cells</th>
<th>22.1, 22.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embryonic and Adult Stem Cells</td>
<td>22.5</td>
</tr>
<tr>
<td>Personalized Stem Cell Lines</td>
<td>22.10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Human Reproduction and Reproductive Health</th>
<th>Text Book 1,27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text Book 2, 3.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Text Book 1,27.8</td>
<td>8</td>
</tr>
<tr>
<td>Text Book 2,4.0</td>
<td></td>
</tr>
</tbody>
</table>

**Human Reproduction, Sex and Sexuality**

- The Male Reproductive System
- The Female Reproductive System
- Gametogenesis
- Menstrual Cycle
- Fertilization and Implantation
- Pregnancy and Embryonic Development
- Parturition and Lactation

**Reproductive Health**

- Reproductive Health: Problems and Strategies
- Birth Control
- Medical Termination of Pregnancy
Contraception

- Barrier Methods
- Chemical Methods
- Hormonal Control Methods
- The Timing Methods
- Intra-uterine Devices
- Surgical Methods

Text Book-1, 27.10

Text Book-1

8. Text books:


2. “Biology” Text Book for Class XII by National Council of Educational Research and Training, New Delhi

9. Reference Material:

- [www.mhhe.com/enger14e](http://www.mhhe.com/enger14e)
- [www.biotec.ca/EN/history.html](http://www.biotec.ca/EN/history.html)
- Molecular Biology of the cell by Brice Alberts, Lexander Johnson, Julian Lewis, Martin Raff, Keith Roberts and Peter Walter, published by Garland science, Taylor & Francis group, UK.

10. Laboratory work: N.A.

11. Evaluation methodology to be followed:

The evaluation and assessment plan consists of the following components:

a. Class attendance and participation in class discussions etc.
b. Quizzes
c. Home-works and assignments
d. Projects
e. Sessional examinations
f. 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 questions
  b. Response to other students’ queries
  c. Contribution in discussion and chat sessions

- Quizzes
  a. Quizzes will be of 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 handwritten form.
  c. The grades and detailed solutions of assignments (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 Mahamaya Technical University.
1. Title of the course: ME103/ME203: Manufacturing Science

2. Work load per week in terms of:
   a. Lecture (L): 3hrs/wk  
      Total Lecture Hours per Semester: 42
   b. Tutorials (T): 0 hrs/wk  
      Total Tutorial Hours per Semester: 0
   c. Practicals (P): 0 hrs/wk  
      Total Lab Hours per Semester: 0
   d. Total Credits L+T+P based 3
   e. One credit is defined as one lecture load per week and two hours of self study to be connected with tutorial, practical work book and assignments.

3. Prerequisites of the course if any:
   Prerequisite for this course on Manufacturing Science is the knowledge of basic Chemistry and Physics.

4. Prerequisite for which next course:
   • Manufacturing Science-I,
   • Manufacturing Science-II,
   • Material Science in Engineering,
   • Production Planning & Control.

5. Why you need to study this course:

Manufacturing science lies at the very center of engineering and it has an important role to play in society, especially in a developing country like India, which bases its economy on technology. A wide ranging variety of fields of learning touch on manufacturing science and it must work organically with the other areas of engineering in order to stimulate innovation and retain flexibility in the face of rapid progress in science and technology.

Manufacturing, in its broadest sense, is the process of converting raw materials into useful products. It encompasses the design and manufacturing of goods, using various production methods and techniques. Manufacturing is the backbone of any industrialized nation and its level of manufacturing activity is directly related to the economic health. Advanced Manufacturing Technology with planned and controlled processes is the present day need of the manufacturing industries.

Course Objective:
Basic idea of the course will be to introduce the basic knowledge of material and their mechanical properties, testing of metals, basic manufacturing techniques, different machines and an introduction to production management. The course has been built for first year undergraduate students and is targeted as a general course for all branches of engineering.

6. Learning outcomes expected from the course:
At the completion of this course, students will have the basic skills required for:
   a) Selection of material for particular application on the basis of their properties and mode of failure.
   b) Understanding the working principles of machines like; lathe, shaper, planer, milling, drilling and grinding machines
   c) Basic ideas of welding, casting and machining with their applications.
7. Details of the syllabus:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book/ Topics</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Properties, Inspection and Testing of materials</td>
<td>Text Book 1 5.1, 5.2, 5.5-5.14, 5.15, 5.16, 5.17, 5.29, 5.19-5.22, 5.28</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>a. Introduction to stress &amp; strain</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Mechanical Properties: Strength, Elasticity, Stiffness, Malleability, Ductility, Brittleness, Resilience, Toughness and Hardness.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Elementary ideas of Creep, Fatigue &amp; Fracture</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. Testing of metals: Destructive testing, Tensile testing, Compression test, Hardness tests, Impact test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Basic Metals &amp; Alloys: Properties and Applications</td>
<td>Text Book 1 6.2, 6.3, 6.7-6.15, 6.26, 6.27, 6.28, 8.2, 8.3, 8.4, 8.7-8.14, 8.20, 8.23</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>2a. Ferrous Materials:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Carbon steel and its classification based on percentage of carbon as low, mild, medium &amp; high carbon steel, its properties &amp; applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Wrought iron, Cast iron, Alloy steels: stainless steel, tool steel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Elementary introduction to Heat- treatment of carbon steels: Annealing, Normalizing, Quenching, Tempering &amp; Case-hardening.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-Ferrous metals &amp; alloys:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Common uses of various non-ferrous metals &amp; alloys and their composition such as Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### III Introduction to Metal Forming & Casting Process and their applications

**Metal Forming:**
- Basic metal forming operations and uses of:
  - Forging, Rolling, Wire & Tube-drawing/making and Extrusion, and their products/applications.
  - Press-work, & die & punch assembly, cutting and forming and their applications.
  - Hot-working versus cold-working.

**Casting:**
- Pattern & allowances.
- Molding sands and their desirable properties.
- Mould making with the use of a core.
- Gating system.
- Casting defects & remedies.
- Cupola Furnace.
- Die-casting and its uses.


### IV Introduction to Machining & Welding and its applications

**Machining:**
- Basic principles of Lathe-machine and operations performed on it.
- Basic description of machines and operations of Shaper, Planer, Drilling, Milling & Grinding.

**Welding:**
- Importance & basic concepts of welding,
- Classification of welding processes.
- Gas-welding, types of flames.
- Electric-Arc welding.
- Resistance welding.
- Soldering & Brazing and its uses.

| Text Book 2 | 3.2, 3.4-3.9, 3.13-3.33, 7.2, 7.3, 7.5, 8.4, 8.5, 5.2-5.6, 11.2, 11.18, 10.2, 10.3, 10.8-10.10 |

### V Miscellaneous Topics

**Manufacturing:**
- Importance of Materials & Manufacturing in Technological & Socio-Economic developments,
- Plant location,
- Plant layout – its types,
- Types of Production.
- Production versus Productivity

**Miscellaneous Processes:**

| Text Book 1 | 1.1, 1.2, 2.2, 2.3, 2.4, 3.1, 3.2, 3.3, 21.21.2 |
8. **Text books to be used**


9. **Reference materials including web sources**

1. DeGarmo, “Materials and Processes in Manufacturing”
2. [http://nptel.iitm.ac.in/courses.php](http://nptel.iitm.ac.in/courses.php)
4. [http://nptel.iitm.ac.in/video.php?subjectId=112107145](http://nptel.iitm.ac.in/video.php?subjectId=112107145)
5. [http://freevideolectures.com/Course/2369/Manufacturing-Processes-II](http://freevideolectures.com/Course/2369/Manufacturing-Processes-II)
6. [http://freevideolectures.com/Course/2368/Manufacturing-Processes-I](http://freevideolectures.com/Course/2368/Manufacturing-Processes-I)
8. [http://nptel.iitm.ac.in/video.php?subjectId=112105126](http://nptel.iitm.ac.in/video.php?subjectId=112105126)

11. **Evaluation methodology to be followed**

The evaluation and assessment plan consists of the following components:

a. Class attendance and participation in class discussions etc.
b. Quizzes
c. Home-works and assignments
d. Projects
e. Sessional examinations
f. 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 to class topics and discussion questions
  b. Response to other students' queries
  c. Contribution to discussion and chat sessions

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

- **Home work and assignments**
  
a. The assignments/home-work 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 assignments (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. There will be comprehensive examinations held on-campus (Sessionals) or off-campus (External) on dates fixed by Mahamaya Technical University.
B. Tech. I / II Semester
(For Civil Engineering)

1. Title of the course: CE103/CE203: GEOLOGICAL SCIENCES

2. Work load per week
   a. Lecture (L): 3 hrs/week  Total Lecture Hours per Semester: 42
   b. Tutorials (T): 0  Total Tutorial Hours per Semester: 0
   c. Practicals (P): 0  Total Lab Hours per Semester: 0
   d. Total Credits: L+T+P based  3
   e. One credit is defined as one lecture load per week and two hours of self-study to be connected with tutorial, practical work book and assignments.

3. Prerequisites of the course: Basic Knowledge of general physics, chemistry & geography.

4. Prerequisite for which next course: This course is prerequisite for:
   - Geolotechnical Engg.
   - Bridge Engg.
   - Tunnel Engg.
   - Earthquake Resistant Design of Structures.
   - Building material and construction.

5. Why you need to study this course:
Geology is the science of the earth's crust, including rocks, its origin, stratification, faults & folds, physical properties, strength, its engineering behavior etc. Since most of the structures specially heavy structures like high rise buildings, dams, bridges etc are founded on rocks. Besides, the tunnels & underground cavities are also constructed for various purposes. It is therefore essential for a Civil Engineer to be aware of geological features & their behavior for planning & development of structures. Further this will also help in selecting suitable construction materials.

Course Objective:
Although this course is not intended to make a trained geologist but this will help assist a Civil Engineer in carrying out the following functions-
   - Understand the interrelation of site selection & geological knowledge for all big construction projects.
   - Properties of rocks & minerals used as building material & as well as base of foundations.
   - Know about the geological features, their causes & effects on construction projects.
Lastly, to gain basic knowledge of geological investigations required for big projects like bridge, tunnel, reservoirs, dams etc.

6. Learning outcomes expected from the course:

At the completion of this Course, student will have the basic skills required to:

a) Understand the properties & structures of rocks & minerals, and there effects on the characteristics of rocks.

b) Geological features, their causes & effects on construction & design of projects.

c) Basic knowledge about the geological investigation to be made for site selection of big construction projects & general methods for performing these investigations.

Aims:

This course will provide a fair knowledge to the students about the geological aspects of all the investigations done for important engineering projects. The emphasis is on-

• Common properties of rocks & minerals.

• Rock deformations, there causes, effects & preventive measures.

• Principles of geological exploration for sub-surface structures & underground water features.

• Understanding of site selection for bridge, tunnel, reservoirs, dams etc. on basis of geological studies.

7. Details of the syllabi:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book1 Page No.</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rocks:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Introduction &amp; importance of Geological knowledge</td>
<td>Chapter-3</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>• Rocks, their origin</td>
<td>Chapter-5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Structure &amp; Texture.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Classification of igneous sedimentary and metamorphic rocks and their suitability as engineering materials.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Stratification &amp; Lamination bedding.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Outcrop-its relation to topography.</td>
<td>Chapter-6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Dip and Strike of bed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Overlap, outlier and Inlier.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Minerals:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Building stones.</td>
<td>Chapter-22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Engineering properties of rocks.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Their physical properties and detailed study of certain rock forming minerals.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Alkali aggregate reaction,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Grouting,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pozzolonic materials.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Mineral constituents of sedimentary, igneous, and metamorphic rocks.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Chapter-4 |

<table>
<thead>
<tr>
<th>III</th>
<th>Rock deformation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Folds.</td>
<td>Chapter-6</td>
</tr>
<tr>
<td>• Faults.</td>
<td>Chapter-22</td>
</tr>
<tr>
<td>• Joints unconformity.</td>
<td></td>
</tr>
<tr>
<td>• Their classification, causes and relation to engineering behavior of rock masses.</td>
<td>Chapter-19</td>
</tr>
<tr>
<td>• Landslides, its causes &amp; preventive measures.</td>
<td></td>
</tr>
</tbody>
</table>

| Chapter-17 |

<table>
<thead>
<tr>
<th>IV</th>
<th>Principles of geological exploration</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Methods for sub-surface structure.</td>
<td>Chapter-11</td>
</tr>
<tr>
<td>• Underground water &amp; its origin</td>
<td></td>
</tr>
<tr>
<td>• Aquifer &amp; Aquiclude</td>
<td></td>
</tr>
<tr>
<td>• Artesian wells.</td>
<td></td>
</tr>
<tr>
<td>• Underground provinces and its role as geological hazard.</td>
<td>Chapter-18,21</td>
</tr>
<tr>
<td>• Site selection for dam.</td>
<td></td>
</tr>
<tr>
<td>• Reservoir, bridge and tunnel.</td>
<td></td>
</tr>
</tbody>
</table>
8. Text books:

9. Reference Material:

10. Laboratory work: N.A.

11. Evaluation methodology to be followed:
The evaluation and assessment plan consists of the following components:

   a. Class attendance and participation in class discussions etc.
   b. Quizzes
   c. Home-works and assignments
   d. Projects
   e. Sessional examinations
   f. 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 questions
  b. Response to other students’ queries
  c. Contribution in discussion and chat sessions

• Quizzes
  a. Quizzes will be of 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 handwritten form.
  c. The grades and detailed solutions of assignments (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 Mahamaya Technical University.
1. Title of the course: CE101/CE201: ENERGY, ENVIRONMENT AND ECOLOGY

2. Work load per week
   a. Lecture (L): 3 hrs/week   Total Lecture Hours per Semester: 42
   b. Tutorials (T): 0   Total Tutorial Hours per Semester: 0
   c. Practicals (P): 0   Total Lab Hours per Semester: 0
   d. Total Credits: L+T+P based 03

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

3. Prerequisites of the course
   (a) Relation between human and nature
   (b) Effect of human activities on environment
   (c) Calculate the intensity of pollutants
   (d) Interaction between nature and human being
   (e) Chemistry of soil, air and water
   (f) Government legislation to control environmental pollution problem

4. Prerequisites of which next course: This course is prerequisite for:
   • Environment Engineering-I & II.
   • Environmental Management for Industries.
   • Environmental Geo-technology.
   • Industrial pollution control & Environmental Audit

5. Objectives of the course
   (a) Develop ability to understand interrelationship between human beings and nature.
   (b) Recognizing basic component of environment i.e. air, water and soil and ecology i.e. energy, producers and decomposers.
   (c) Identify problem of pollution along its solution
   (d) Evaluate quantity and quality of natured resources and how natural resource can be available for a long time.
   (e) Teach students how their activities support environment instead of degradation of environment by anthropogenic activities.
6. Learning outcomes from this course

(a) To be able to plan and prepare suitable methods for the conservation of environmental segments.
(b) To be able to plan importance of sustainable developments i.e. appropriate use of natural resources.
(c) To be able to plan and prepare new techniques of development by reducing low rate consumption of natural resources through Environment Impact Assessment (EIA) process.
(d) To be able to understand role of individual NGO and Government for environment protection activities.

7. Details of the syllabi:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book1 Page. No.</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction:</td>
<td>(Text book-1 Chapter-1)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>• Definition of environment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Need of public awareness.</td>
<td>(Text book-2, 1.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Segments of environment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Importance of Environment.</td>
<td>(Text book-1,Chapter-2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ecosystem- definition, classification and components.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Function of ecosystem.</td>
<td>(Text book-2, 1.4,1.4.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Nitrogen and sulphur cycle.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Sustainable Development:</td>
<td>Text book-1,chapter-5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>• Definition, principle, parameter and its challenges.</td>
<td>(T.Book-2, Chapter-9)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Biodiversity: classification, measurement and conservation.</td>
<td>(T.Book-1,Chapter-7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Natural resources: availability &amp; problems.</td>
<td>(Text book-1,Chapter-8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Minerals &amp; Energy Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Seed suicide and sustainable agriculture.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### III  Energy:
- Classification of energy resources.
- Fossil fuels, nuclear and hydroelectric energy.
- Solar, wind, biomass, biogas and hydrogen fuel energy.

Text book-1,chapter-8

### IV  Pollution:
- Environment pollution.
- Water pollution,
- Solid waste management & hazards waste management.
- Current environmental issues
- Problem with urbanization and automobile pollution and their control.
- Adverse effects of Pollution: Climate change; Green house effect, Global warming, Acid rain and ozone layer depletion.

T.Book-1,Chapter-11
(T.Book-1,Chapter-12),T.Book-2,Ch.-7
T.book-1,Ch.-13
T.book-1,Ch.-18
T.BOOK-2,ch.-2

### V Environmental protection & Control Measures:
- Government initiatives i.e. air, water and environmental protection act.
- Role of NGOs.
- Environment Impact Assessment (EIA): definition, methodology and process.
- Environmental education: its principle and objectives.
- Case Studies – Bhopal Gas Tragedy, London Smog.
- Water Borne and water induce disease, arsenic problem in drinking water

T.book-1,Ch.-20

### Text Books
1. Environment Studies - R Rajagopalan, Oxford Publications.
2. Environmental Chemistry – A K De, New Age Publications.
**Reference Books**

2. Environmental Science – G T Miller, Publisher – Thomson Asia, Singapore.

**Internet Link:-**

(i) [www.epa.gov](http://www.epa.gov)
(ii) [www.unfccc.int](http://www.unfccc.int)
(iii) [www.unep.org](http://www.unep.org)
(iv) [www.cpcb.nic.in](http://www.cpcb.nic.in)
(v) [www.environmentalksc.nasa.gov](http://www.environmentalksc.nasa.gov)
B. Tech. I / II Semester
(Common to all branches)

1. **Title of the course:** AS105/AS205: Professional Communication

2. **Work load per week**
   a. **Tutorial (T):** 1 hrs/week  
       **Total Tutorial Hours per Semester:** 14
   b. **Practicals (P):** 2 hrs/week  
       **Total Lab Hours per Semester:** 28
   c. **Total Credits:** T+P  
       **2**

**Objectives of the course:** To impart basic Communication skills to the first year UG students in the English language through rigorous practice and use of various categories of common words and their application in sentences; to enable them to achieve effective language proficiency for their social, professional & inter personal communication both in speaking & writing.

**Desired Outcome of the Course:** The student must be able to:

i) Understand and use about 1200 to 1500 General Purpose words of English language,  
ii) Express his /her ideas and thoughts in speech or writing,  
iii) Be able to comprehend, converse, interact and participate in any day-to-day events and situation  
iv) Write grammatically correct sentences for various forms of written communication to express oneself.

**Key Concepts:**

1. **Language/Communication in context:** communication as a means of sharing information, speakers-listener and reader-writer relationship, process, importance, purpose, features of communication (accuracy, brevity, clarity and appropriateness in communication), barriers to communication, personal and interpersonal communication.

2. **Writing Skills:** Learning words for general purpose, use through situations, sentence formation and use of given set of words in different contexts, usages of words in different tenses, aspect and moods, narrative in first, second and third person, meaning and usages of connectives, modifiers and models, phrasal verbs, connotations, various types of sentences and paragraphs, features of paragraph (cohesion and coherence).

3. **Speaking Skills:** Speech and verbal communication, articulation (pronunciation of different sounds and words i.e. vowels, consonants, diphthongs, (IPA Chart) and words), paralinguistic features, formal informal speaking, extempore, discussion and presentation.

4. **Reading Comprehension:** kinds and types of reading texts, basic steps to effective reading, abstracting, précis writing and summarizing taking example from different texts.
5. **Listening Comprehension:** Process and types of listening, steps of listening, barriers to listening, Fluency & speed, impact of pronunciation on comprehension through various texts, intelligent listening.

**Details of Lab Sessions:**

<table>
<thead>
<tr>
<th>Details of Lab Sessions:</th>
<th>Topics to be covered in the lab</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session</strong></td>
<td><strong>Lab 1-8</strong></td>
</tr>
<tr>
<td></td>
<td>1. Vocabulary exercises on the newly learnt words with evaluation</td>
</tr>
<tr>
<td></td>
<td>2. Simple conversation exercises using the newly learnt words</td>
</tr>
<tr>
<td></td>
<td>3. Practicing the pronunciation of the newly learnt words</td>
</tr>
<tr>
<td></td>
<td>4. Practice of sounds (Vowels &amp; Consonants)</td>
</tr>
<tr>
<td></td>
<td>5. Transcription of words</td>
</tr>
<tr>
<td><strong>Lab 9-18</strong></td>
<td>1. Reading &amp; Comprehension of simple passages with exercises for evaluation</td>
</tr>
<tr>
<td></td>
<td>2. Listening &amp; Comprehension of simple passages with exercises for evaluation</td>
</tr>
<tr>
<td></td>
<td>3. Discussion &amp; simple conversation exercises based on the passages</td>
</tr>
<tr>
<td><strong>Lab 19-21</strong></td>
<td>1. Understanding of tenses &amp; practice exercises with evaluation</td>
</tr>
<tr>
<td></td>
<td>2. Practice exercises on enhancing conversational skills with evaluation</td>
</tr>
<tr>
<td><strong>Lab 22-28</strong></td>
<td>1. Understanding the conceptual inputs on presentation skills</td>
</tr>
<tr>
<td></td>
<td>2. Watching examples of good/bad presentation skills &amp; evaluating with the group</td>
</tr>
<tr>
<td></td>
<td>3. Conducting presentations in front of the group along with peer and teacher evaluation</td>
</tr>
</tbody>
</table>

**Text Books & references:**


**Suggested readings**

Performance Evaluation & Examination:

The student will have to perform on per lecture basis and the peer to peer learning and evaluation method is to be used. However, since the students will be given class tests and assignments hence these will have to be corrected and marked by the teachers and the marks made public with formative feedback to the student explaining where the mistake is and what the correct ways to answer the questions are.

Assignments are to be given to reinforce the concepts and extend the practice of words and their usage by the student in different situations, tenses and accounts in first, second or third person.

The Course examination will be practical based and the student will have to be proficient to demonstrate the language capability as will be tested on the basis of question paper sent from the university.
B. Tech. I / II Semester
(Common to all branches)

1. Title of the course: CE102/CE202: Computer Aided Engineering Graphics

2. Work load per week
   a. Lecture (L):0  Total Lecture Hours per Semester: 0
   b. Tutorials (T):1 Total Tutorial Hours per Semester: 14
   c. Practicals (P): 3 hrs/week Total Lab Hours per Semester: 42
   d. Total Credits: T+P 2

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

3. Prerequisites of the course: Basic knowledge of Computer operations and geometry.

4. Prerequisite for which next course: This course is prerequisite for-
   • Cad lab.
   • Building Construction
   • Design of steel structure
   • Design of concrete structure
   • Town planning and Architecture
   • Structural detailing
   • Building planning and drawing

5. Why you need to study this course: To develop the ability and understanding of the following-
   • Drawing Instrument and their uses
   • Dimensioning, scales and units, lettering
   • Computer based 2D/3D Environment.
   • Projections- Orthographic, isometric etc.
   • Sections –plan and elevations
6. Learning outcomes expected from this course

- Understanding and preparing 2D/3D drawing on computer.
- A fair knowledge of units, scales and drawing instruments and their application.
- To be able to understand and prepare drawing: plan, elevation and cross sections.
- This will form basic inputs for developing drawings for various structures from designs.

7. Details of the syllabi:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book 1/ Topics</th>
<th>Weeks</th>
</tr>
</thead>
</table>
| I    | **Introduction to computer aided sketching:**  
\- Drawing instruments and their uses  
\- Lettering, dimensioning and free hand practicing  
\- Computer screen: layout of menus/tool bars  
\- Creations of 2D/3D Environment.  
\- Drawing scale, units etc.  
\- Creation of shapes: square, rectangle, circle, curves etc. | chapter-1  
chapter-2 | 2 |
| II   | **Orthographic projections:**  
\- Definitions  
\- Projections of points, lines  
\- True and apparent lengths, inclinations  
\- Orthographic projections of plane surfaces  
\- Projections of solids: tetrahedron, hexahedron  
\- Prisms and pyramids  
\- Cylinders and cones | Chapter-7  
Chapter-8,9  
Chapter-10,11  
Chapter-12 | 8 |
| III & IV | **Sections and Development of lateral surfaces of solids**  
\- Sectional views  
\- Apparent shapes and true shapes | CHAPTER-14 | 3 |
of sections of prism, pyramids, cylinder, cones
Lateral surface of above solids
Their frustums and truncation

**Isometric projections:**
- Isometric scales
- Isometric projections of simple figures:
  * tetrahedron
  * hexahedron
  * right regular prisms
  * pyramids
  * cylinder and cones
  * Spheres
  * cut spheres and combination of solids

Note:
At least 2 sheets to be prepared through Cad software.

8. **Textbooks:**

2. **A Primer on Computer Aided Engineering Drawing** – 2006, Published by VTU, Belgaum.

**Reference Books:**

B. Tech. II SEMESTER

(Common to all branches except Biotechnology and Agricultural Engineering branches)

1. **Title of the course**: Engineering Mathematics – II, AS-201

2. **Work load per week**
   
   a. **Lecture (L)**: 3 hrs/week  
      **Total Lecture Hours per Semester**: 45
   
   b. **Tutorials (T)**: 1 hrs/week  
      **Total Tutorial Hours per Semester**: 15
   
   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**: Intermediate of U.P. Board or equivalent + Engineering Mathematics-I.

4. **Prerequisite for which next course**: This course is prerequisite for
   
   • ASM-301, Engineering Mathematics – III

5. **Why you need to study this course**: Differential equations are mathematical models of engineering phenomena. The knowledge and skills acquired by studying this course will enable the students to understand engineering mechanics and electric circuit theory in a better way. The methods of solution of partial differential equations and Fourier expansion will improve their understanding of fluid flow and heat transfer.

   **Course Objective:**

   Basic idea of the course will be to introduce the basic concepts of differential equations (ordinary and partial both) and their methods of solution the knowledge of which is required for engineering mechanics and electrical engineering. To train the students in expanding functions in Fourier series and Laplace transform methods which are used in signal processing and circuit theory.
6. Learning outcomes expected from the course:

At the completion of this Course, student will have the basic skills required to:

a. Understand the underlying concepts and methods of their solution of ordinary and partial differential equations which are useful in understanding phenomena like fluid flow, heat transfer and electrical circuits

b. To expand periodic functions into Fourier series the knowledge of which is useful in signal processing.

c. To solve initial value problems from circuit theory using the knowledge of Laplace transforms.

7. Details of the syllabi:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Text Book/Topic/Article</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Ordinary Differential Equations</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• First order exact differential equations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Linear differential equations of nth order with constant coefficients, complementary functions and particular integrals.</td>
<td>9.4, 9.5 (Text Book 1)</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>• Cauchy-Euler differential equations.</td>
<td>9.6 (Text Book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Solution of second order differential equations using the method of: (a) Reduction</td>
<td>9.10 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Change of independent variable</td>
<td>9.11 (V) (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Variation of parameters</td>
<td>9.7 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Simultaneous differential equations.</td>
<td>9.9 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Application to mechanical vibrations and electric circuits.</td>
<td>9.13, 9.14 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Series Solutions of Ordinary Differential Equations and Special functions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Power series solution of ordinary linear differential equations of second order with</td>
<td>10.1, 10.2 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td>Variable Coefficient</td>
<td>Frobenius method.</td>
<td>Bessel equation and its series solutions, Recurrence relations and orthogonality of Bessel functions.</td>
<td>10.3 (Text book 1) 11.3 (Text book 1) 11.5 (Text book 1)</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------</td>
<td>------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Bessel equation and its series solutions, Recurrence relations and orthogonality of Bessel functions.</td>
<td>11.5 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bessel equation and its series solutions, Recurrence relations and orthogonality of Bessel functions.</td>
<td>11.5 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Legendre equation and its series solutions, Rodrigue’s formula, Recurrence relations and orthogonality of Legendre polynomials.</td>
<td>11.5 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td>III Laplace Transform</td>
<td>Definition, Existence theorem (statement only).</td>
<td>12.1, 12.2 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laplace transform of derivatives, integrals, Unit step (Heaviside) and impulse (Dirac-delta) functions.</td>
<td>12.2, 12.3 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laplace transform of periodic functions.</td>
<td>12.4 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inverse Laplace transform</td>
<td>12.5, 12.6, 12.7 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Convolution theorem</td>
<td>12.8 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Application to solution of simple linear differential equations.</td>
<td>12.9 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Application to solution of simultaneous differential equations.</td>
<td>12.10 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td>IV Fourier series and Partial Differential Equations</td>
<td>Periodic functions, Fourier series of period $2\pi$, Euler’s formulae Vector differentiation.</td>
<td>17.1 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fourier series of arbitrary period.</td>
<td>17.3 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fourier series of even and odd functions.</td>
<td>17.3 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Half range sine and cosine series.</td>
<td>17.4 (Text book 1)</td>
<td></td>
</tr>
<tr>
<td>Classification &amp; Applications of Partial Differential Equations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Harmonic analysis.</td>
<td>17.5 (Text book 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Formation of partial differential equations.</td>
<td>18.1 (Text book 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Types of solutions.</td>
<td>18.2 (Text book 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Solution of Lagrange’s linear partial differential of first ( 1 ) order.</td>
<td>18.3 (Text book 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Non-linear partial differential equation of first order and its solution by Charpit’s Method (without proof only) , simple problems.</td>
<td>18.5 (Text book 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Homogenous partial differential equations with constant coefficients.</td>
<td>18.6 (Text book 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Non-Homogenous partial differential equations with constant coefficients.</td>
<td>18.7 (Text book 1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Classification of Partial Differential Equation of 2nd order into parabolic, hyperbolic and elliptic with illustrative examples. | 19.2 (Text book 1) |
• Method of separation of variables. | 19.1 (Text book 1) |
• One dimension Heat equations and problems. | 19.3, 19.4 (Text book 1) |
• One dimension Wave equations and problems. | 19.5, 19.6 (Text book 1) |
• Laplace equation in two-dimensions. | 19.7 (Text book 1) |
Wave and heat equations in two –dimensions-illustrative examples.*

Note: in the case of illustrative examples, questions are not to be set.

Equations of transmission lines.

Text Books:-


Reference Books:-


10. Laboratory work: Not required.

11. Evaluation methodology to be followed:

The evaluation and assessment plan consists of the following components:

a. Class attendance and participation in class discussions etc.

b. Quizzes

c. Home-works and assignments

d. Sessional examinations
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 questions.
  - b. Response to other students’ queries
  - c. Contribution in discussion and chat sessions

- **Quizzes**
  - a. Quizzes will be of 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 handwritten form.
  - c. The grades and detailed solutions of assignments (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 Mahamaya Technical University.
AS-202: Engineering Physics - II

Unit-I

Wave Mechanics: Introduction to wave-particle duality, de Broglie matter waves, Phase and group velocities, Heisenberg’s uncertainty principle and its applications, Wave function-characteristics and significance, Time-dependent and time-independent Schrödinger’s wave equations, Particle in one-dimensional rigid box, Qualitative analysis of potential step, Potential barrier and potential well, Tunneling effect.

Unit-II

Superconductivity and Nanomaterials: Temperature dependence of resistivity, Effect of magnetic field (Meissner effect), Penetration depth, Type I and Type II Superconductors, Temperature dependence of critical field, BCS theory (qualitative), High temperature superconductors, Applications of superconductors (qualitative). Introduction to nanomaterials, Basic principles of nano-science and technology, Creation and use of bucky balls, Structure, properties and uses of carbon nanotubes, Some applications of nano-materials.

Unit-III

Dielectric and Magnetic Properties of Materials: Dielectric constant and polarization of dielectric material, Types of polarization, Polarizability, Equation of internal field in liquid and solids (qualitative discussion, no derivations), Clausius Mossotti equation, Frequency dependence of dielectric constant, Dielectric losses (qualitative), Ferro-, & Piezo- electricity (qualitative), Important applications of dielectric, Ferro-, and piezo electric materials, Langevin’s theory for dia-, and paramagnetic materials (for paramagnetic qualitative only), Ferromagnetic materials, Phenomenon of hysteresis and its applications.

(for Mechanical Engineering etc.)

Unit – IV

(a) Crystal Physics: Crystalline and non-crystalline materials, Crystal systems and Bravais lattices, Space lattices of cubic systems, Miller indices, Relation between inter-planer distance and cube edge, some important crystal structure, Atomic packing factor of the cubic system, Relation between lattice constant and density. Diffraction of X-rays by crystal planes, Bragg’s law.

(b) Thermodynamics: Internal Energy, Enthalpy, Entropy, Phase diagram.

Unit - V

(b) Production and measurement of (i) low temperatures, and (ii) high and low pressures: Importance of cryogenics, Joule Thomson expansion, Cooling by an external refrigerant, adiabatic expansion and de-magnetization, Metallic resistance thermometers, thermistors and magnetic thermometers. Mean free path, rotary- and diffusion pumps, Pirani and Penning gauges, Generation of high pressure using hydraulic system and using Diamond Anvil system, Measurement of high
pressure using Bourdon tube gauges and using the gauges based on resistance variation with pressure.

(c) **Ultrasonics:** Generation, Detection and applications of ultrasonic.

(for Electrical Engineering etc.)

**Unit – IV**

(a) **Semiconductor Physics:** Introduction to the concept of electrical conductivity, conductivity of conductors and semiconductors. Hall effect and Hall coefficient, Fermi-Dirac probability distribution function, Position of Fermi level in intrinsic semiconductors (with derivation) and in extrinsic semiconductors, variation of Fermi level with temperature (without derivation), Photovoltaic effect, working of a solar cell on the basis of band diagrams and Applications.

(b) Production and measurement of (i) low temperatures, and (ii) high and low pressures: Importance of cryogenics, Joule Thomson expansion, Cooling by an external Refrigerant, adiabatic expansion and de-magnetization, Metallic resistance thermometers, thermistors and magnetic thermometers.

Unit-V

(a) Production and measurement of high and low pressures: Mean free path, rotary- and diffusion pumps, Pirani and Penning gauges, Generation of high pressure using hydraulic system and using Diamond Anvil system, Measurement of high pressure using Bourdon tube gauges and using the gauges based on resistance variation with pressure.

(b) **Optical Fiber Communications:** Fiber communication systems (Block diagrams only), Splices and connectors, Couplers and switches, Time-, and wavelength division multiplexing, Erbium- doped fiber amplifier, *pin* photo diode, Avalanche photodiode

(for Computer Science and Engineering etc.)

**Unit – IV**

(a) **Semiconductor Physics:** Introduction to the concept of electrical conductivity, conductivity of conductors and semiconductors. Hall effect and Hall coefficient, Fermi-Dirac probability distribution function, Position of Fermi level in intrinsic semiconductors (with derivation) and in extrinsic semiconductors, variation of Fermi level with temperature (without derivation), Photovoltaic effect, working of a solar cell on the basis of band diagrams and Applications.

(b) **Information Storage:** Basics of magnetic, and semiconductor memories

**Unit-V**

**Information Optics:** Basics of Fourier optics, Optical transform, 4-f coherent imaging system, spatial filtering, Liquid crystal spatial light modulator, Image processing, Optical correlation, Pattern recognition, Optical (including holographic) information storage and retrieval. Basics of Quantum computing.

Reference Books

(1) J.W. Jewett, Jr. and R. A. Serway, Physics for Scientists and Engineers with Modern Physics, 7th Edn. (CENGAGE Learning)

(2) A. Beiser, Concepts of Modern Physics (McGraw Hill)

(3) C. Kittel, Solid State Physics, 7th Edn. (Wiley Eastern)

(4) V. Raghavan, Materials Science and Engineering (Prentice Hall, India)
1. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
2. To study of polarization of light by simple reflection using laser.
3. To study the Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor using Hall effect set up.
4. To determine the energy band gap of a given semiconductor material.
5. To draw hysteresis curve of a given sample of a ferromagnetic material.
6. To determine the ballistic constant of a ballistic galvanometer.
7. Magnetic susceptibility of a paramagnetic solution.
8. To draw the V-I characteristics of a p-n junction diode (forward & reverse bias).
10. To create and measure low pressure in a vacuum unit.
11. Measurement of high temperature using an optical pyrometer.
12. Determination of moment of inertia of a flywheel about its own axis.