

**First Year ‘all common’ Subjects for:**

- Civil Engineering
- Civil & Rural Engineering
- Computer Engineering
- Electronics & Communication Engineering
- Electrical & Electronics Engineering

**First Year ‘Partial Common’ subjects for:**

- BEIT
- BE Software

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## 1. MEC 119.3 Applied Mechanics I (3-2-0)

### Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

### Course Objectives:

This course has been developed to provide the basic knowledge of engineering mechanics to the students of engineering so that it would be beneficial to understand structural engineering. The knowledge of mechanics can be utilized in a wide range of engineering applications using Newton's laws of motion and mechanical equilibrium of different force systems. This course shall be considered as a basic for all branches of Engineering of Pokhara University in the first year of undergraduate program.

### Course Contents:

1. **Introduction** (2 hrs)
  - 1.1 Definition and scope of Applied Mechanics
  - 1.2 Concept of Statics and Dynamics
  - 1.3 Concept of Particle
  - 1.4 Concept of Rigid, Deformed and Fluid Bodies
  - 1.5 Fundamental Concepts and Principles of Mechanics: Newtonian Mechanics
  - 1.6 System of Units
2. **Review of Coordinate System** (2 hrs)
  - 2.1 Cartesian Coordinate System
  - 2.2 Polar Coordinate System
  - 2.3 Cylindrical Coordinate System
  - 2.4 Spherical Coordinate System
  - 2.5 Review of Vector Algebra
3. **Forces acting on particles and rigid body** (7 hrs)
  - 3.1 Types of Forces: Point Force, Translational and Rotational Force- Relevant Examples
  - 3.2 Resolution and Composition of Forces- Relevant Examples
  - 3.3 Principle of Transmissibility and Equivalent Forces- Relevant Examples
  - 3.4 Moments: Moment of a Force about a point and an axis- Relevant Examples
  - 3.5 Theory of Couples: Relevant Examples
  - 3.6 Resolution of a Force into Forces and a Couple- Relevant Examples
  - 3.7 Resultant of Force and Moment for a System of Force: Examples
4. **Basic Concept of Static Equilibrium** (2 hrs)
  - 4.1 Concept of Load types, Load Estimation and Support Idealizations- Examples and Standard Symbols
  - 4.2 Free Body Diagram- Relevant Examples
  - 4.3 Physical Meaning of Equilibrium and its essence in structural application
  - 4.4 Equation of Equilibrium in Two/Three Dimensions
5. **Friction Forces** (3 hrs)
  - 5.1 Introduction
  - 5.2 Types of Friction and its Coefficients: Static and Dynamic
  - 5.3 Laws of Friction
  - 5.4 Angle of Friction

- 5.5 Engineering Examples of usage of Friction
6. **Center of Gravity, Centroid and Moment of Inertia** (6 hrs)
- 6.1 Concept and Calculation of Centre of Gravity and Centroid of Line/Area /Volume – Examples
- 6.2 Concept and Calculation of Second Moment of Area/ Moment of Inertia and Radius of Gyration- Relevant Examples
- 6.3 Use of Parallel Axis Theorem: Relevant Examples
7. **Analysis of Beam** (5hrs)
- 7.1 Introduction Beam
- 7.2 Use of statically determinant beam
- 7.3 Relationship between Load, Shearing Force and Bending Moment
- 7.4 Calculation and drawing of Axial Force, Shear Force and Bending Moment
8. **Analysis of Truss** (4 hrs.)
- 8.1 Introduction to determinant truss
- 8.2 Use of truss in engineering application
- 8.3 Analysis of force by method of joint
- 8.4 Analysis of force by method of section
9. **Kinematics of Particles and Rigid body** (6 hrs)
- 9.1 Rectilinear Kinematics: Continuous Motion
- 9.2 Position, Velocity and Acceleration of a Particle and Rigid body
- 9.3 Determination of Motion of Particle and Rigid body
- 9.4 Uniform Rectilinear Motion of a Particles
- 9.5 Uniformly Accelerated Rectilinear Motions of Particles
- 9.6 Curvilinear Motion of a Particle
- 9.7 Rectangular Components of velocity and Acceleration
- 9.8 Introduction of Tangential and Normal Components
- 9.9 Radial and Transverse Components
10. **Kinetics of Particles and Rigid body: Force and Acceleration** (6 hrs)
- 10.1 Newton's Second Law of Motion and Momentum
- 10.2 Equation of Motion and Dynamic Equilibrium: Relevant Examples
- 10.3 Angular Momentum: Rate of Change and Conservation
- 10.4 Motion of Various Particles and Relative Velocity
- 10.5 Equation of Motion- Rectilinear and Curvilinear
- 10.6 Rectangular Components: Tangential and Normal
- 10.7 Polar Coordinates: Radial and Transverse Components
11. **Moment and Energy in Rigid body** (2 hrs)
- 11.1 Introduction to Moment and Energy
- 11.2 Conservation of Linear and Angular Momentum

**Text Books:**

1. "Engineering Mechanics-Statics and Dynamics", Shames, I. H. 3<sup>rd</sup> ed., New Delhi, Prentice Hall of India, 1990.
2. "Mechanics of Engineers-Statics and Dynamics", F. P. Beer and E. R. Johnston, Jr. 4<sup>th</sup> Edition, Mc Graw-Hill Book Co., New York, USA (Asia Editions), 1987.

**References:**

1. "Engineering Mechanics-Statics and Dynamics", R.C. Hibbeler, Ashok Gupta, 11<sup>th</sup> edition. New Delhi, Pearson, 2009.
2. "Engineering Mechanics- Statics and Dynamics", I.C. Jong and B.G. Rogers.
3. "Engineering Mechanics- Statics and Dynamics", D.K. Anand and P.F. Connif.
4. "Engineering Mechanics of Solids", Egor .P. Popov, 2<sup>nd</sup> Edition, New Delhi, Prentice Hall of India, 1996.

5. "Engineering Mechanics- Statics & Dynamics", Dr. D.S. Kumar,S.K. Kataria & Sons, New Delhi, Reprint 2011.
6. Practice guide in Applied Mechanics, D. B. Pandit, Ramesh Khanal

## 2. ELE 105.3 Basic Electrical Engineering (3-1-2)

### Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

### Course Objectives:

1. To analyze electric circuits (A.C. & D. C).
2. To work on electrical instrumentation projects.
3. To operate, distinguish and use electrical devices and machines.

Chapter	Content	Hrs.
1	<b>Introduction</b> Role of electricity in modern society, Energy sources and production, generation, transmission and distribution of electrical energy, consumption of electricity	2
2	<b>DC Circuit Analysis</b> Circuits concepts (lumped and distributed parameters), linear and nonlinear parameter, passive and active circuits, Circuit elements (Resistance, capacitance and inductance), their properties and characteristics in a geometrical and hardware aspects, color coding, Series of parallel combination of resistances, Equivalent resistance and its calculation, star-delta transformation, concept of power, energy and its calculations, short and open circuit, ideal and non-ideal sources, source conversion, voltage divider and current divider formula, Kirchhoff's current and voltage laws, nodal method and mesh method of network analysis (without dependent source), network theorem (i.e Superposition, Thevenin's, Norton's), maximum power transfer.	15
3	<b>Single Phase AC Circuits Analysis</b> Generation of EMF by electromagnetic induction, Generation of alternating voltage, sinusoidal functions-terminology (phase, phase angle, amplitude, frequency, peak to peak value), average values and RMS or effective value of any types of alternating voltage or current waveform, phase algebra, power triangle, impedance triangle, steady state response of circuits (RL, RC,RLC series and parallel) and concept about admittance, impedance reactance and its triangle), instantaneous power, average real power, reactive power, power factor and significance of power factor, resonance in series and parallel RLC circuit, bandwidth, effect of Q factor in resonance.	10
4	<b>Poly-phase AC Circuit Analysis</b> Concept of a balanced three phase supply, generation and differences between single phase over three phase system, star and delta connected supply and load circuits. Line and phase voltage\current relations, power measurement, concept of three phase power and its measurement by single and two wattmeter method	6

## 5 Electric Machines

12

Review of magnetic circuits

Transformers: Principle of operations, features, equivalent circuits, efficiency & regulation, open circuit & short circuit tests

DC motors: Performance & operation, basic characteristics of motors & generators, speed control & selection of motors

AC machines: Induction motors (working principles, construction features and uses), Synchronous motors (working principles, construction and uses)

### Textbook

1. Boylested, Albert , "Introduction of Electric circuit" Prentice Hall of India Private Limited, New Delhi
2. Tiwari, S.N, "A first course of electrical engineering" att. Wheeler & Co.Ltd Allahbad.

### References:

- 1) Thereja B. L & Thereja A. K " A text book of Electrical Technology, S Chand Publication.
- 2) Jain& Jain" ABC of Electrical Engineering"

### Laboratory Work:

1. To measure current, voltage and power across the passive components.
2. To verify Kirchhoff's Current Law (KCL) & Kirchhoff's Voltage Law (KVL)
3. To verify Thevenin's Theorem.
4. To verify maximum power transfer theorem.
5. To verify superposition theorem.
6. To measure three phase power by using two wattmeter
7. To determine efficiency and voltage regulation of a single-phase transformer by direct loading.
8. To study open circuits & short circuits tests on a single phase transformer
9. To study the speed control of dc shunt motor by.
  - i. Varying the field current with armature voltage held constant field control.
  - ii. Varying the armature voltage with field current held constant armature control.
10. To study open circuits and load test on a dc shunt generator (separately excited)
  - i. To determine magnetization characteristics
  - ii. To determine V-I characteristics of a dc shunt generator

### 3. CHM 103.4 Chemistry (4-1-2)

#### Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

#### Course Objectives:

1. Analyze chemical behavior of materials
2. Analyze the water quality.
3. Analyze environmental aspects of various elements and compounds.

Chapter	Content	Hrs.
1.	<b>Ionic Equilibria and Electro Chemistry</b> Introduction and types of buffer solutions, mechanism, Henderson- Hassel Balch equation, electro chemical cells, Galvanic cell, cell notation, cell reaction, cell potential, single electrode potential , standard electrode potential, electro chemical series & its applications, Nernst equation, corrosion, its type, mechanism and control.	10
2	<b>General Inorganic Chemistry</b> Ionization energy, electro negativity, electron affinity, characteristic properties of S and P block elements, introduction of Transition metals, characteristic properties of transition metals (electronic configuration, atomic radii, variable oxidation states, complex formation, color and magnetic properties.	10
3	<b>General Organic Chemistry</b> Reaction intermediates: carbocations, carbanions and carbon free radicals, stereoisomerism Organic reaction mechanism: Nucleophilic substitution reactions (SN1&SN2), Electrophilic aromatic substitution, Elimination (E1 & E2), Electrophilic and free radical addition reaction	10
4	<b>Polymer Chemistry</b> Polymer and polymerization, basic concepts , types of polymerization (addition and condensation), thermoplastics and thermosetting plastics, preparation, properties and uses of : polyethylene, PVC, Teflon, Bakelite's, Nylon, polyester, polyurethelene and silicon, rubber, processing of natural rubber and vulcanization	10
5	<b>Analytical Chemistry</b> Introduction and application of following analytical techniques: fractional distillation, chromatography (paper, thin layer) NRM, Mass spectroscopy	6
6	<b>Industrial Chemistry</b> Introduction of paints, chemistry of paints, lubricants and its classification, cement, chemistry of cement, manufacture & its setting mechanism, Explosives: TNT, TNG	4
7	<b>Environmental Chemistry</b> Water pollution- causes of water pollution, acid rain, alkalinity COD, DO, Hardness,(effects to human	10

health), control

Air pollution: causes, global warming and climate change ozone layer depletion and CFC, control measures

Soil pollution: causes, effects and its control measures

### **Laboratory works**

#### **Objectives**

- Use techniques apparatus and instructions properly
- Interpret, evaluate and report upon observations and experimental results
- Design/plan on investigation, select techniques, apparatus and materials
- Evaluate methods and suggest possible improvements

### **Laboratory works**

1. Determine of total alkalinity of given water sample
2. Determination of hardness of water sample by complexometric titration
3. Determination of free chlorine in the given water sample
4. Preparation of buffer and determination of pH of the solution
5. Estimation of DO in the given water sample
6. Estimation of COD in the given water sample
7. To separate the ink mixture by paper chromatography or TLC (Demo)
8. To purify a sample of mixture of crude alcohol and petroleum by fractional distillation (Demo)
9. To estimate carbon monoxide gas in the car exhaust (Demo)

#### **Text books:**

1. Physical Chemistry, B.S. Bahl and G.D. Tuli
2. Advanced inorganic Chemistry, J. D. Lee
3. Advance Organic Chemistry, Morrison and Boyd 6<sup>th</sup> edition
4. Engineering Chemistry (with experiments), Sunita Rattan , 4th edition Publisher of Engineering and Computer books

#### **Reference Books:**

1. Satya Prakash, Tuli, Basu, Madan: Advanced Inorganic Chemistry, S. Chanda & Company Ltd, New Delhi
2. Polymer Science, V.R. Gowariker, N. V. Vishwanathan
3. Environmental Chemistry, Anil Kumar Datta
4. Advanced Organic Chemistry, A. Bahl and B. S. Bahl
5. Text book of Chemistry P.N. Chaudhary and M.L. Bhusal
6. Lab manual of Engineering Chemistry by S.K. Bhasin and Sudha Rani



#### 4. ENG 104.2 Communication Technique (2-2-1)

##### Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

##### Course Objectives:

The main objectives of this course are:

4. To develop the ability to deliver technical knowledge orally in English.
5. To be able to comprehend and take notes after listening.
6. To fasten reading skills in technical and non-technical reading materials.
7. To develop summarizing skills in writings.
8. To write reports, letters, description on technical talks, seminar papers, memoranda, application

Chapters	Content	Hrs.
<b>1</b>	<b>Review of Written English</b>	<b>2</b>
	<ul style="list-style-type: none"> <li>• Identification of Sentence and clause</li> <li>• Classification of sentence (simple, compound, complex)</li> <li>• transformation of sentences</li> </ul>	
<b>2</b>	<b>Oral Communication and Note Taking</b>	<b>9</b>
	<ul style="list-style-type: none"> <li>• Variety of English (BrE, AmE, formal, informal, polite, familiar, tentative)</li> <li>• General rules of pronunciation (English Vowels and Consonants)</li> <li>• General rules of stress and intonations</li> <li>• Oral presentation/technical talk: Environmental pollution, construction, water resources, impact of satellite communication, urban development, impact of computer in modern society</li> </ul>	
<b>3</b>	<b>Technical Writing Skills</b>	<b>10</b>
	<ul style="list-style-type: none"> <li>• Preparation of short memoranda (Importance, formats)</li> <li>• Business letters (Importance-purposes)</li> <li>• Preparation of job application and CV</li> <li>• Description writing (Process, Mechanism, Place etc.)</li> <li>• Calling meeting and writing minutes, notification, preparation of agenda</li> </ul>	
<b>4</b>	<b>Reading Skills</b>	<b>9</b>
	<ul style="list-style-type: none"> <li>• Comprehension questions and exercises from:</li> <li>• The use and the misuse of science, Road foundation, Beauty, Custom, The story of an hour (Kate Chopin), Knowledge and wisdom, Freedom, Letter from foreign grave (D. B Gurung), Natural Resources of Nepal: Forests &amp; Water (Mani Bhadra Gautam)</li> <li>• Note making and precise writing from any passage</li> </ul>	

**Tutorial Works:**

1. Some general rules of pronunciation..
2. To present a seminar paper/report/proposal.
3. To participate in a group discussion.
4. To conduct a meeting.
5. To prepare and practice to face an interview.

**Textbook:**

1. Andrea J. Rutherford. *Basic Communication Skills for Technology*. 2nd Edition. Addison Wesley. Pearson Education Asia (LPE) ISBN: 8178082810
2. Khanal Arjun, *Communication Skills in English*, Sukunda Pustak Bhawan, 2010

**Reference Books:**

1. Anne Eisenberg, *Effective Technical Communication*, Mc-Graw Hill 1982.
2. V.R. Narayanaswami, *Strengthen your writing*, Orient Longman, Madras.
3. Champa Tickoo & Jaya Sasikumar, *Writing with a Purpose*, Oxford University Press, Bombay.
4. A handbook of pronunciation of English words (with 90-minute audio cassettes) *Communication Skills in English*.
5. Chopin, Kate. "The Story of an Hour", *Creative Delights*
6. *Gautam Shreedhar, Creation & Criticism: A Miscellaneous Thought*
7. *Gautam Mani Bhadra, Essays, Stories, Passages, Paragraphs and Letter writing for the Young Learners, Nirantar Prakashan, Kathmandu, 2008*

## 5. MTH 111.3 Engineering Mathematics I (3-2-0)

### Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

### Course Objectives:

After the completion of this course students will be able to apply the concept of calculus (Differential and integral), analytical geometry and vector in their professional courses.

Chapter	Content	Hrs.
1	<p><b>Limit, Continuity and Derivative:</b></p> <ul style="list-style-type: none"> <li>i. Limit, continuity and Derivative of a function with their properties</li> <li>ii. Mean values Theorem with their application</li> <li>iii. Higher order derivative</li> <li>iv. Indeterminate forms</li> <li>v. Asymptote</li> <li>vi. Curvature</li> <li>vii. Ideas of curve tracing</li> <li>viii. Extreme values of functions of single variables</li> </ul>	15
2	<p><b>Integration with its Application:</b></p> <ul style="list-style-type: none"> <li>i. Basic integration, standard integral, definite integral with their properties</li> <li>ii. Fundamental theorem of integral calculus (without proof)</li> <li>iii. Improper integral</li> <li>iv. Reduction formulae and use of beta Gamma functions</li> <li>v. Area bounded by curves</li> <li>vi. Approximate area by Simpsons and Trapezoidal rule,</li> <li>vii. Volume of solid revolution</li> </ul>	17
3	<p><b>Two dimensional geometry:</b></p> <ul style="list-style-type: none"> <li>i. Review ( circle, Translation and rotation of axes)</li> <li>ii. Conic section( parabola, ellipse, hyperbola),</li> <li>iii. Central conics (Introduction only).</li> </ul>	7
4.	<p><b>Vector Algebra:</b></p> <ul style="list-style-type: none"> <li>i. Review of vector and scalar quantity</li> <li>ii. Space coordinates</li> <li>iii. Product of two or more vectors</li> <li>iv. Reciprocal system of vectors and their properties</li> <li>v. Equations of lines and planes by vector methods</li> </ul>	6

### Text Books:

1. Engineering Mathematics I: Prof. D.D Sharma (Regmi), Toya Narayan Paudel, Hari Prasad Adhikari, Sukunda Publication Bhotahity , Kathmandu
2. Calculus and analytical geometry: George B Thomas, Ross L. Finney

**Reference Books:**

1. Calculus with analytical geometry: E.W. Swokowski.
2. Coordinate Geometry: Lalji Prasad.
3. Vector Analysis: M. B. Singh
4. Integral Calculus: G.D. Panta.

## 6. MTH 121.3 Engineering Mathematics II (3 – 2 – 0)

Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

### Course Objective:

The main objective of this course is to provide the basic knowledge of three dimensional geometry, Calculus of several variables, differential equation, Laplace transform. After the completion of this course, students can use their knowledge in their professional course.

Chapter	Content	Hrs
<b>1</b>	<b>Three Dimensional geometry :</b> i. Review of direction cosines, direction ratios, Planes ii. Straight lines iii. Sphere and its tangent plane iv. Cone and cylinder( definitions, standard equation only)	<b>12</b>
<b>2</b>	<b>Partial derivatives and Extreme values for function of two or more variables:</b> i. Definitions, total derivatives, Chain rule, Eulers theorem for function of two or three variables, its application ii. Extreme values for two or more variables	<b>6</b>
<b>3</b>	<b>Laplace transformation:</b> i. Definition ii. Derivation of formulae iii. Application of laplace transform, iv. Inverse laplace transform v. Convolution theorem on laplace transform and application	<b>8</b>
<b>4</b>	<b>Differential equation:</b> i. Order and degree of differential equation ii. First order differential equation with their solutions (separable, reducible to separable form exact ness condition), linear and Bernoulies equation) iii. Second order differential equation (Homogeneous and non homogeneous) with constant coefficient as well as variable coefficients. iv. Initial value problem. v. Power Series solution vi. Legendres and Bessel equation with their solution, properties and application	<b>13</b>
<b>5</b>	<b>Double Integral:</b> i. Definitions, Fubinis theorems (statement only) ii. Change of order, iii. Change Cartesian integral to equivalent polar integral iv. Area and volume by double integral	<b>6</b>

**Text Books:**

1. Engineering Mathematics II: Prof. D.D Sharma (Regmi), Toya Narayan Paudel, Hari Prasad Adhikari, Sukunda publication, Bhotahity, Kathmandu.
2. Advance Engineering Mathematics : Erwin Kreyszig.

**Reference Books:**

1. Calculus with analytical geometry: E.W. Swokowski.
2. Algebra: G.D Pant
3. Three Dimensional Geometry: Y.R Sthapit, B.C Bajracharya
4. Calculus and analytical geometry: George B Thomas, Ross L. Finney

## 7. MEC 109.2 Engineering Drawing (0-0-6)

### Evaluation:

	Theory	Practical	Total
Sessional	-	50	50
Final	-	50	50
Total	-	100	100

### Course Objectives:

1. To develop sketching, lettering and drafting skills
2. To draw projections, drawings of various geometric figures.
3. To draw assembly of machine parts.
4. To develop ability of preparing working drawings

### Course Contents:

#### 1. Instrumental Drawing, Practices and Techniques (12 hrs)

Equipment and metals, Description of drawing instruments, auxiliary equipment and drawing materials, Techniques of instrument drawing, pencil sharpening, securing paper, proper use of T-squares, triangles, scales, dividers, compasses, erasing shields, French curves, inking pens.

#### Freehand Technical Lettering

Lettering strokes, letter proportions, use of pencils and pens, uniformity and appearance of letters, freehand techniques, inclined and vertical letters and numerals, upper and lower cases, standard English lettering forms.

#### Dimensioning

Fundamentals and Techniques: size and location dimensioning, IS conversion; Use of scales, measurement units, reducing and enlarging drawings; General dimensioning practices: placement of dimensions aligned and unidirectional recommended practice, some 50 items.

#### 2. Applied Geometry (24 hrs)

Plane geometrical construction: Bisecting and trisecting lines and angles, proportional division of lines, construction of angles, triangles, squares, polygons, constructions using tangents and circular arches. Methods of drawing standard curves such as ellipse, parabolas, hyperbolas, involutes, spirals, cycloid and helices (cylindrical and helical); Solid geometrical construction: Classification and pictorial representation of solid regular objects such as: prisms, square, cubical, triangular and oblique, Cylinders: right and oblique, Cones: right and oblique, Pyramids: square, triangular, oblique, truncated; Doubly-curved and warped surfaces: Sphere, torus, oblate ellipsoid, conoid, serpentine, paraboloid, hyperboloid

#### Basic Descriptive Geometry

Introduction: Application of descriptive geometry principles to the solution of problems involving positioning of objects in three-dimensional space; The projection of points, and planes in space; Parallel lines; True length of lines: horizontal, inclined and oblique lines; Perpendicular lines; Bearing of a line; Point view of end view of a line; Shortest distance from a point to a line; Principal lines of a plane; Edge view of a plane; True shape of an oblique plane;

Intersection of a line and plane; Angle between a line and a plane; Angle between two non-intersecting (skew) lines; Dihedral angle between two planes; Shortest distance between two skew lines.

- 3. Theory of Projection Drawing (24hrs)**  
 Perspective projection drawing; Orthographic projection; Axonometric projection; Oblique projection; First and third angle projection;  
**Multi-view Drawings**  
 Principal views: Methods for obtaining orthographic views: Projection of lines, angles and plane surfaces, analysis in three views; Projection of curved lines and surfaces; Object orientation and selection of views for best representation; Full and hidden lines. Orthographic drawings: Making an orthographic drawing, Visualizing objects from the given views; Interpolation of adjacent areas; True-length lines; Representation of holes; conventional practices.
- Sectional views**  
 Full section view; Half section; Broken section; Revolved section; Removed (detail) sections; Phantom of hidden section; Auxiliary sectional views; Specifying cutting planes for sections; conventions for hidden lines, holes, ribs, spokes.
- Auxiliary Views**  
 Basic concept and use of auxiliary views; Drawing methods and types of auxiliary views; Symmetrical and unilateral auxiliary views; Projection of curved lines and boundaries; Line of intersection between two planes; True size of dihedral angles; True size and shape of plane surfaces.
- 4. Development and Intersections (15hrs)**  
 Development: General concepts and practical considerations, Development of a right or oblique prism, cylinder, pyramid and cone; Development of truncated pyramid and cone; Triangulation method for approximately developed surfaces; Transition pieces for connecting different shapes; Development of a sphere; Intersections: Lines of intersection of geometric surfaces; Piercing point of a line and a geometric solid; intersection lines of two planes; Intersection of prisms and pyramids; Intersection of a cylinder and an oblique plane; Intersection of a sphere and an oblique plane; Constructing a development using auxiliary views; Intersection of two cylinders; Intersection of a cylinder and cone.
- 5. Machine Drawing (15hrs)**  
 Introduction: production of complete design and assembly drawings; Fundamental techniques: size and location dimensioning; placement of dimension lines and general procedures; standard dimensioning practice (IS system); Limit dimensioning: nominal and basic size, allowance, tolerance, limits of size, clearance fit, interference fit; basic hole system and shaft systems; Thread and standard machine assembly elements: screw threads: ISO standards, representation and dimensioning; Fasteners: type and drawing representation, keys, collars, joints, springs bearings; Assembly drawings: drawing layout, bill of materials, drawing layout, bill of materials, drawing numbers.
- Laboratory Work:**  
 Freehand technical lettering and use of drawing instruments; Dimensioning; Geometrical and Projection drawing; Descriptive geometry; Projection and multiview drawings; Sectional views; Auxiliary views, Freehand sketching and visualization; Development and intersections; machine and assembly drawings.
- Reference Books:**
8. Luzadder, *Fundamentals of Engineering Drawing*, Prentice Hall of India Ltd., 8<sup>th</sup> edition, 1981.
  9. French, C.J. Vierck and R.J. Foster, *Engineering Drawing and Graphic Technology*, McGraw-Hill, 1981.
  10. Machine drawing P.S. Gill, S.K. Kataria and Sons, India, 7<sup>th</sup> Edition, 2008.



## 8. MEC 178.1 Mechanical Workshop (0-0-3)

### Evaluation:

	Theory	Practical	Total
Sessional	-	100	100
Final	-	-	-
Total	-	100	100

### Course Objectives:

To provide instructions and practical experience in basic mechanical workshop methods

### Course Contents:

Chapters	Content	Hrs.
1	<b>Mechanical Workshop Materials</b> Introduction to mechanical workshop, Basics of steel and cutting materials, Common non-ferrous metals, Important mechanical properties.	4
2	<b>Measurement and Measuring Equipment</b>	1.5
3	<b>Bench Tools and Basic Hand Operations</b> Filing, Sawing, Sheet metal working, screw thread and screw thread cutting	1.5
4	<b>Joining Processes</b> Riveting, Soldering, Brazing, Welding	1.5
5	<b>Introduction to Machine Tools</b> Elements of machine tools, Cutting actions and tooling	1.5
6	<b>Familiarization with Basic Machine Tools</b> Lathe, Milling machine, Drill presses, Power saws, Shaping Machine and Grinding machines	5

### Practical:

- To convert a metallic job piece into a prescribed form using mechanical bench tool.
- To turn a cylindrical job piece to prescribed dimension by using lathe machine.
- To convert a metallic job piece to prescribed dimension by using milling machine.
- To provide surface finish to a metallic piece by using the shaper machine.
- To weld required metallic pieces together by using electric arc and gas welding, to given shape and size.
- To make knot & bolt of given size and type
- To make tray/dust bin/ pen holder or similar item with sheet metal.

### Reference Books:

- Anderson and E.E. Tatro, *Shop Theory*, McGraw-Hill 5<sup>th</sup> edition, 1942.
- Lascoe, C.A. Nelson and H.W. Porter, *Machine Shop Operation and Setups*, American Technical Society, 1973.

13. *Machine Shop Practice – Volume II*, Industrial Press, New York, 1971.
14. Oswald, *Technology for Machine Tools*, McGraw-Hill Ryerson, 3<sup>rd</sup> edition.
15. Oberg, Jones and Gorton, *Machinery's Handbook*, 23<sup>rd</sup> edition, Industrial Press, New York

## 9. CMP 103.3 Programming in C (3-0-3)

### Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

### Course Objectives:

The object of this course is to acquaint the students with the basic principles of programming and development of software systems. It encompasses the use of programming systems to achieve specified goals, identification of useful programming abstractions or paradigms, the development of formal models of programs, the formalization of programming language semantics, the specification of program, the verification of programs, etc. the thrust is to identify and clarify concepts that apply in many programming contexts:

Chapter	Content	Hrs.
1	<b>Introduction</b> History of computing and computers, programming, block diagram of computer, generation of computer, types of computer, software, Programming Languages, Traditional and structured programming concept	3
2	<b>Programming logic</b> Problems solving(understanding of problems, feasibility and requirement analysis) Design (flow Chart & Algorithm), program coding (execution, translator), testing and debugging, Implementation, evaluation and Maintenance of programs, documentation	5
3	<b>Variables and data types</b> Constants and variables, Variable declaration, Variable Types, Simple input/output function, Operators	3
4	<b>Control Structures</b> Introduction, types of control statements- sequential, branching- if, else, else-if and switch statements, case, break and continue statements; looping- for loop, while loop, do—while loop, nested loop, goto statement	6
5	<b>Arrays and Strings</b> Introduction to arrays, initialization of arrays, multidimensional arrays, String, function related to the strings	6
6	<b>Functions</b> Introduction, returning a value from a function, sending a value to a function, Arguments, parsing arrays and structure, External variables, storage classes, pre-processor directives, C libraries, macros, header files and prototyping	6

<b>7</b>	<b>Pointers</b>	<b>7</b>
	Definition pointers for arrays, returning multiple values form functions using pointers. Pointer arithmetic, pointer for strings, double indirection, pointer to arrays, Memory allocation-malloc and calloc	
<b>8</b>	<b>Structure and Unions</b>	<b>5</b>
	Definition of Structure, Nested type Structure, Arrays of Structure, Structure and Pointers, Unions, self-referential structure	
<b>9</b>	<b>Files and File Handling</b>	<b>4</b>
	Operating a file in different modes (Real, Write, Append), Creating a file in different modes (Read, Write, Append)	

**Laboratory:**

Laboratory work at an initial stage will emphasize on the verification of programming concepts learned in class and use of loops, functions, pointers, structures and unions. Final project of 10 hours will be assigned to the students which will help students to put together most of the programming concepts developed in earlier exercises.

**Textbooks:**

1. Programming with C, Byran Gottfried
2. C Programming, Balagurusami

**References**

1. A book on C by A L Kely and Ira Pohl
2. The C Programming Language by Kerighan, Brain and Dennis Ritchie
3. Depth in C, Shreevastav

## 10. CMP 104.3 Object Oriented Programming in C++ (3-1-3)

### Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

### Course Objectives:

- To familiarize with Object Oriented Concept.
- To introduce the fundamentals of C++
- To enable the students to solve the problems in Object Oriented technique
- To cope with features of Object Oriented Programming

### Course Contents:

Chapter	Content	Hrs.
1	<b>Thinking Object Oriented</b> Object oriented programming a new paradigm, a way of viewing world agent, types of classes, computation as simulation, coping with complexity, nonlinear behavior of complexity, abstraction mechanism	4
2	<b>Classes and Methods:</b> Review of structures, classes and inheritance, state, behavior, method, responsibility, encapsulation, data hiding, Functions: friend function, inline function, static function, reference variable, default argument	7
3	<b>Message, Instance and Initialization</b> Message, message passing formalization, message passing syntax in C++, mechanism for creation and initialization (constructor and its types), Issues in creation and initialization: memory map, memory allocation methods and memory recovery	6
4	<b>Object Inheritance and Reusability</b> Introduction to inheritance, Subclass, Subtype, Principle of Substitutability; Forms of polymorphism and their implementation in C++, inheritance merits and demerits, composition and its implementation in c++, The <i>is-a</i> rule and <i>has-a</i> rule, Composition and Inheritance contrasted, Software reusability	9
5	<b>Polymorphism</b> Polymorphism in programming language, Varieties of polymorphism, compile time polymorphism, function overloading, operator overloading, type conversion, polymorphic variable, run time polymorphism, object pointer, this pointer, virtual function, overriding, deferred method, pure polymorphism.	8
6	<b>Template and generic programming</b> Generic and template functions and classes, cases study: container class and the	4

standard template library, Exception handling

## 7 Object oriented Design

7

Reusability implies non- interference, Programming in small and programming in large, components and behaviors, role of behaviors in OOP, CRC, sequence diagram, Software components, formalizing the interface, interface and implementation, Design and representation of components, coming up with names, implementation components, integration of components

### Laboratory Work

There shall be 20 exercises in minimum, as decided by the faculty. The exercises shall encompass a broad spectrum of real-life and scientific problems, development of small program to the development of fairly complex subroutines, programs for engineering applications and problem solving situations. Laboratory assignments will be offered in groups of two to four for evaluation purpose. In general, the Laboratory Work must cover assignments and exercises from the following areas:

1. Data types – control structures, functions and scoping rules.
2. Composite data types, C++ strings, use of " Constant " keyword, pointers and references
3. Classes and data abstraction
4. Inheritance, abstract classes and multiple inheritance
5. Friend functions, friend classes and operator overloading.
6. Static class members
7. Polymorphism, early binding and late binding
8. C++ type conversion
9. Exception handling
10. Function templates, class templates and container classes.

### Textbooks:

1. Budd, T., *An Introduction to Object Oriented Programming*, Second Edition, Addison-Wesley, Pearson Education Asia, ISBN: 81-7808-228-4.
2. R. Lafore, *Object Oriented Programming in Turbo C++*, Galgotia Publications Ltd. India, 1999

### Reference Books:

1. E Balaguruswamy, *Object Oriented Programming with C++*, Third Edition
2. Tata McGraw-Hill ISBN:0-07-059362-0, Parson David, *Object Oriented Programming with C++*, BPB Publication\ISBN817029-447-9

## 11. PHY 102.4 Physics (4-2-2)

### Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

### Course Objectives:

The main objectives of this course are:

1. To apply the theory of simple Harmonic motion in different elastic systems.
2. To apply theory of wave propagation and knowledge of resonance.
3. To apply and analyze the Optical properties in different optical systems.
4. To make use of fundamentals of electromagnetic equipment.
5. To use the knowledge of basic physics in different engineering fields.

Chapter	Content	Hrs
1	<b>Mechanical Oscillation</b> Introduction and equation of Simple Harmonic Motion, energy in Simple Harmonic Motion, oscillation of mass –spring system, compound pendulum	4
2	<b>Wave motion</b> Introduction of wave, wave velocity and particle velocity, types of waves, equation, energy, power and intensity of plane progressive wave, standing wave and resonance.	4
3	<b>Acoustics</b> Reverberation of sound, absorption coefficient, Sabines formula, introduction, production and applications of ultrasonic wave	4
4	<b>Physical Optics</b> Interference: introduction, coherent sources, interference in thin films due to reflected and transmitted light, Newton's Ring (3) Diffraction: introduction, fraunhofer diffraction at single slit and double slit diffraction grating (2) Polarization: introduction, double refraction, Nicol prism, optical activity, specific rotation, wave plates (3)	8
5	<b>Laser and Fiber Optics</b> Introduction of laser, spontaneous and stimulated emission, optical pumping, He-Ne laser, Ruby Laser, use of laser, Propagation of light waves, types of optical fiber, applications of optical fiber	4
6	<b>Electrostatics</b> Electric charge, electric force, electric flux, electric potential, Gauss law and its applications, electric field intensity and electric potential due to dipole, electric potential due to quadrupole, capacitors, electrostatic potential energy, dielectrics and gauss law charging and discharging of capacitor	8

<b>7</b>	<b>Electricity and magnetism</b>	<b>10</b>
	Electric current, resistance, resistivity and conductivity, atomic view of resistivity, magnetic field, magnetic force, Lorentz force, Hall effect, Biot-Savart's law and its applications, force between two parallel conductors, Ampere's circuital law and its applications, Faraday's law of electromagnetic induction, self-induction R-L circuit, energy stored in magnetic field and magnetic energy density	
<b>8</b>	<b>Electromagnetism</b>	<b>9</b>
	LC oscillation, Damped oscillation, forced oscillation and resonance, Maxwell's equations displacement current, wave equations in free space, continuity equation, E and B fields, Poynting vector, radiation pressure	
<b>9</b>	<b>Photon and matter waves</b>	<b>4</b>
	Photon, group velocity and phase velocity, De Broglie wavelength, Schrodinger wave equation, one dimensional potential well, tunneling effect	
<b>10</b>	<b>Semiconductors and super conductivity</b>	<b>5</b>
	Introduction, types of semiconductors Doping, P-N Junction, Metal- semiconductor junction, junction breakdown, junction capacitance, electrical conduction in metals, insulators and semiconductors according to band theory of solids, introduction to superconductor	

**Textbooks:**

3. Fundamental of Physic by Robert Resnick and David Haliday
4. A Text Book of Engineering Physics, T. R. Lamichane
5. A text book of optics by Subramanyam and Brijlal
6. Modern physics by R. Murugason

**Reference Books:**

16. Concept of physic by H.C Verma
17. Modern Engineering Physic by A.S Basudeva
18. Electronics by B.L Thereja
19. Principles of Electronics, V. K. Meheta

**Laboratories:**

1. To determine the acceleration due to gravity & radius of gyration by single bar pendulum.
2. To determine the frequency AC mains by using son meter apparatus
3. To determine the wave length by using diameter of Newton's ring
4. To determine the wave length of laser light by using diffraction grating
5. To determine the value of Modulus of Elasticity of the material given and Moment of Inertia of Circular disc using torsional pendulum
6. To determine the capacitance of given capacitor by charging and discharging through resistor
7. To determine the low resistance of a given wire and resistance per unit length of the wire by using Carey-foster bridge
8. To plot a graph current and frequency in an LRC series circuit and to find: i) the resonance frequency  
ii) the quality factor

**Lab textbook:** B. Sc Practical Physics by C. L. Arora



## 12. MEC 189.2 Thermal Science (2-1-2)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

### Course Objectives:

The broad objective of this course is to provide working knowledge of theories and applications of thermal science.

The specific objectives of the course are:

1. To make able to apply laws of thermodynamics in various systems.
2. To make able to distinguish the cycles in various engines, and pumps.
3. To make able to calculate energy/quantity of heat transfer by conduction and radiation.

Chapter	Content	Hrs.
1	<p><b>Concept and definitions</b></p> <p>Thermodynamics, Applications of thermodynamics, Thermodynamic system, Macroscopic and microscopic and microscopic Approaches, Properties and state of a substance: Thermodynamic properties and types, State, path, process, cycle.</p> <ul style="list-style-type: none"> <li>• Processes (definition, characteristics, features, Examples): Quasi-equilibrium(states) process, Reversible process, Irreversible process,</li> <li>• Specific volume, Pressure, Atmospheric pressure, Gauge pressure, Absolute pressure</li> <li>• Equality of temperature: Zeroth law of thermodynamics</li> </ul>	2
2	<p><b>Properties of pure substances</b></p> <ul style="list-style-type: none"> <li>• Pure substance: Homogenous in composition, Homogenous in chemical aggregation, Invariable in chemical aggregation</li> <li>• Vapour-liquid solid phase equilibrium in pure substance: Steam generation(formation) process from ice to steam, Wet steam and quality, T-v diagram of water, P-v Diagram of water, P-t diagram of water</li> <li>• Equations of state for a simple compressible substance:</li> <li>• Tables and diagrams of thermodynamic properties</li> <li>• Determination of Specific volume, Specific enthalpy and Specific entropy of wet and superheated steam</li> </ul>	3
3	<p><b>Work and heat</b></p> <p>Definition of work: in mechanics and in thermodynamics,  <b>Work done in quasi-equilibrium process</b>                      Displacement work, Work done in different reversible processes:</p> <ul style="list-style-type: none"> <li>• Isochoric process</li> <li>• Isobaric process</li> <li>• Isothermal process</li> <li>• Polytrophic process</li> <li>• Definition of heat: comparison between heat and work,</li> </ul>	2

- 4 First law of thermodynamics** **4**
- First law for cycle: First law for closed system undergoing a cycle, Verification of this law by wheel paddle experiment
  - First law for process: Difference between stored and internal energy, Stored energy
  - Internal energy: Joule's law and its verification
  - Enthalpy
  - Specific heats: Specific heat capacity of gas at constant volume, Specific heat capacity of gas constant pressure
  - First law as a rate equation:
  - Conservation of mass and the control volume
  - First law for control volume
  - **Steady state steady flow process:** Assumption, Steady state steady flow energy equation(SFEE), Application of SFEE: Heat exchanger, nozzle, diffuser, turbine, Rotary compressor, Throttling device, Boiler
  - Uniform state uniform flow process: Assumptions, 1<sup>st</sup> law for uniform state uniform flow process
- 5 Second law of thermodynamics** **3**
- Heat engines: 4 components diagram and the schematic diagram, efficiency  
Refrigerator and heat pump: 4 components diagram and schematic diagram, COP of refrigerator and heat pump
  - **Second law:** Limitation of first law of thermodynamics, Kelvin-Planck statement, Clausius statement
    - Equivalence of Kelvin-Planck and Clausius statements:
    - Factors causing irreversibility
    - Carnot theorem
    - Thermodynamic temperature scale
- 6 Entropy** **4**
- Inequality of Clausius, Entropy as a property of a system, Entropy of pure substance, Entropy change in reversible process, lost work, principle of increase of entropy, Entropy change of an ideal gas, the poly-tropic process for an ideal gas, concepts of reversibility, irreversibility and availability
- 7 Some Power Cycles** **4**
- Vapor Power Cycles: Rankine cycle (working process, efficiency, Effect of pressure and temperature on Rankine cycle)
  - Air Standard Cycles: Air standard cycles: Carnot cycle (Working processes & Efficiency), Brayton cycle (Working processes & Efficiency)
  - Internal combustion engines: Otto cycle (Working processes & Efficiency), Diesel cycle (Working processes & Efficiency), Comparison between Otto and diesel cycle

## 8 Heat transfer

7

- Modes of heat transfer: Conduction, Convection, radiation
- Conduction : Fourier's law (Statement, Mathematical modeling, Assumption for this laws, Thermal conductivity)
- One dimensional steady state heat conduction: Through a plane, Through a hollow cylinder, Through a hollow sphere
- Composite wall: Heat flow through multilayer plane slabs, Numerical on wall of planes, cylinders and spheres in series.
- Thermal resistance and conductance: Electrical analogy of the conduction heat flow
- Overall heat transfer co-efficient: Heat transfer through a plane slab separating two fluid media
- Basic laws of radiation: Emissive power and emissivity, Stefan-Boltzmann's law, Kirchoff's law, Wei's displacement law
- Black and gray bodies: Reflectivity, absorptive and transmissibility, Black and grey bodies
- Radiant exchange between infinity parallel planes
- Newton's law
- Mechanism of forced and free convection
- Dimensionless parameters: Reynold's number, Nusselt's number, Prandtl's number

## 9 Introduction to Refrigeration System

1

Introduction, Refrigeration cycle

### Laboratory Work:

1. To measure the pressure, specific volume and temperature
2. To find out the efficiency of a compressor.
3. To measure the rate of heat transfer by conduction.
4. To measure performance of a small internal combustion engine
5. To measure the heat transfer by thermal radiation.
6. To measure the performance of a Refrigeration/Heat pump

### Textbooks:

1. Howell J.R. and R.O. Buckius, *Fundamentals of Engineering Thermodynamics*, McGraw-Hill Publishers, 1994.

### Reference Books:

1. Van Wylen, G.J. and Richard E. Sonntag, *Fundamentals of Classical Thermodynamics*, Wiley Eastern Limited, New Delhi, 1989.
2. Bayazitoglu, Y. and M. Necati Ozisik, *Elements of Heat Transfer*, McGraw-Hill Book Company, 1998.
3. Kreith, F., *Principles of Heat Transfer*, International Text book Company, Scranton Pennsylvania, 2<sup>nd</sup> Edition, 1965.