

WORKSHOP ENGINEERING**Course Code: ME 103****Lecturer: 1****Tutorial: 0****Practical: 3****Course Objective:****Year:I****Part: I****Course Credit:1**

To deliver fundamental concepts in the field of basic workshop technology required for manufacturing simple metal components and articles.

	Teaching Schedule Hours/Week			Evaluation Scheme				Total
				Internal Evaluation		Final Evaluation		
	Lecture	Tutorial	Practical	Theory	Practical	Theory	Practical	
Cr	1	0	3	10	40	-	-	50

Unit 1: Introduction to General Safety (2 hours)

- 1.1. Screw Drivers, Chisels, Punches, Scrapers, Files, Scribes, Bench Tools, Machinist's Hammers, Pliers and Cutters, Hacksaws, Wrenches, Bench Vise, Hand drills, Hand Shears, Taps and Dies, Rivets, Rules, Tapes and Squares, Soldering Iron etc.

Unit 2: Hand Working Tools Operation (1 hour)

- 2.1 Riveting, Sawing, Filing, Scribing, Shearing, Soldering, Threading

Unit 3: Measuring and Gauging (1 hour)

- 3.1 Introduction to Semi precision tools: Calipers, Depth Gauge, Feeler Gauge
- 3.2 Introduction to precision tools: Micrometers, Vernier Calipers, Hole Gauge, Vertical Height Gauge, Telescopic Gauge, Bevel protractor, Dial Indicator, Surface plate, and Gauge Blocks

Unit 4: Drills and Drilling Processes (1 hour)

- 4.1 Types of Drill Presses
- 4.2 Working Holding Devices and Accessories
- 4.3 Cutting Tools
- 4.4 Geometry and Grinding of Drill Bits
- 4.5 Cutting Speeds
- 4.6 Operations: Drilling, Counter boring, Sinking, Lapping, Honning, Reaming
- 4.7 Drilling safety

Unit 5: Machine Tools (4 hours)

- 5.1 General Safety

5.2 **Engine Lathes:** Introduction, Physical Construction, Types of Lathe, Operations: Facing, Turning, Threading

5.3 **Shapers:** Introduction, Types, Physical Construction, Applications

5.4 **Milling Machines:** Introduction, Types, Physical Construction, Applications, Milling cutters-Plain, Side, Angle, End form, Work Holding Devices, Cutter Holding Devices

5.5 **Grinding Machines:** Introduction, Abrasive Bonds, Grinding Wheels, Rough Grinders (Portable Grinders, Bench Grinders, Swing Grinders, Frame Grinders, Abrasive Belt Grinders), Precision Grinders (Cylindrical Grinders, Surface Grinders)

Unit 6: Metal Joining (2 hours)

6.1 Safety Consideration

6.2 Introduction

6.3 Soldering, Brazing

6.4 Welding: Gas Welding, Arc Welding, Resistance Welding, Tungsten Inert Gas Welding (TIG Welding), Metal Inert Gas Welding (MIG Welding)

Unit 7: Forging (1 hour)

7.1 Introduction,

7.2 Forging Tools

7.3 Forging Presses and Hammers

7.4 Operations: Upsetting, Drawing, Cutting, Bending, Punching

7.5 Applications, Advantages, and Limitations

Unit 8: Sheet Metal Works (1 hour)

8.1 Introduction to Sheet Metal Tools

8.2 Marking and Layout

8.3 Operations: Bending, Cutting, Rolling

Unit 9: Foundry Practices (1 hours)

9.1 Introduction to Foundry Tools

9.2 Pattern Making

9.3 Core Making

9.4 Melting Furnace

9.5 Sand Casting Process

Unit 10: Material Properties (1 hour)

10.1 Tool materials: Low, Medium, and High Carbon steels; Hot and Cold Rolled Steels; Alloy Steels; Ceramic and Carbide materials

10.2 Heat Treatment Methods for steels: Hardening, Quenching, Annealing, Normalizing and Tempering

10.3 Non-ferrous metals: Aluminum, Brass, and Bronze with their comparative properties

Practicals:

1. Bench Tools and hand Operations: Measuring, Marking, Layout, Cutting, Drilling, Filing, Tapping, Assembly
2. Drilling Machines

3. Measuring and Gauging Instruments
4. Lathe: Operations-Plain cutting, Facing, Turning, Cutting off, Knurling, Taper Turning, Drilling, and Boring.
5. Basic Operations: Shaper, Grinding machines, Milling machines
6. Welding: Gas welding, Arc welding
7. Practices in: Sheet metal works, Foundry, and Forging

References

1. S. K. Hajra Choudhary and A.K. Hajra Choudhary, “Elements of Workshop Technology-Vol-I (Manufacturing Processes)”, Media Promoters and Publishers Pvt. Ltd., India
2. S. K. Hajra Choudhary, S.K. Bose, and A.K. Hajra Choudhary, “Elements of Workshop Technology-Vol-II (Machine Tools)”, Media Promoters and Publishers Pvt. Ltd., India
3. R.S. Khurmi and J.K. Gupta, “A Text Book of Workshop Technology”, S. Chand and Company Ltd, New Delhi, India
4. Prof. B.S. Raghuwanshi, “ A Course in Workshop Technology-Vol-I”, Dhanpat Rai and Co. (P) Ltd, Delhi, India
5. Prof. B.S. Raghuwanshi, “ A Course in Workshop Technology-Vol-II”, Dhanpat Rai and Co. (P) Ltd, Delhi, India
6. H.S. Bawa, “ Workshop Technology-Vol-I”, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, India
7. H.S. Bawa, “ Workshop Technology-Vol-II”, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, India

Distribution of marks:

The final evaluation will have questions from all the units. The marks distribution for all the units will be as follows:

		Scheduled Hours	Marks and Remarks
Unit 1	Introduction to general safety	2	10 marks Internal Remaining 40 Marks Internal Practical Examination No Final Examination
Unit 2	Hand Working Tools Operation	1	
Unit 3	Measuring and Gauging	1	
Unit 4	Drills and Drilling Processes	1	
Unit 5	Machine Tools	4	
Unit 6	Metal Joining	2	
Unit 7	Forging	1	
Unit 8	Sheet Metal Works	1	
Unit 9	Foundry Practices	1	
Unit 10	Material Properties	1	
Total		15	

Note: The marks distribution shown in the table above might be subjected to minor changes.

Thermodynamics and Heat Transfer

Course code: ME 101

Lecturer: 3
Tutorial: 1
Practical: 1.5

Year: I
Part: I
Course Credit: 3

Course Objective:

To deliver fundamental concepts, thermodynamics laws, thermodynamics cycles, Heat Transfer, and their applications.

	Teaching Schedule Hours/Week			Evaluation Scheme				Total
				Internal Evaluation		Final Evaluation		
	Lecture	Tutorial	Practical	Theory	Practical	Theory	Practical	
Cr	3	1	1.5	40	10	60	15	125

Unit 1: Introduction and Energy Transfer (6 hours)

- 1.1. definition and applications of thermodynamics
- 1.2. microscopic versus Macroscopic analysis
- 1.3. Basic Concepts and Definitions:
 - 1.3.1. System, Boundary, Surrounding, and Universe
 - 1.3.2. Closed systems, open systems, and Isolated systems
 - 1.3.3. Thermodynamics Properties: Intensive and extensive properties: Definitions and examples
 - 1.3.4. Thermodynamics: state, Path, Process, Reversible and Irreversible processes, Quasi-static equilibrium process
 - 1.3.5. Thermodynamic Equilibrium, Mechanical Equilibrium, Chemical Equilibrium, and Thermal Equilibrium
- 1.4 Properties: Pressure, Temperature, Specific volume, Specific weight
- 1.5 Equality of Temperature: Zeroth Law of Thermodynamics
- 1.6 Energy Transfer as Heat and Work
 - 1.6.1 Definition of energy and its concept: Internal Energy, Potential Energy, and Kinetic Energy
 - 1.6.2 Stored Energy, Transient Energy, and Total Energy
 - 1.6.3 Energy Transfer: Heat and Work
 - 1.6.4 Derivation of Displacement Work (Quasi-static work) transfer
 - 1.6.5 Power

Unit 2: Properties of Simple Compressible Substance (6 hours)

- 2.1 concepts of pure substance and Simple Compressible Substance
- 2.2 State postulate of simple compressible substance
- 2.3 Formation of steam from ice to vapor using P-v, T-q, and T-v diagrams

2.4 Two-phase (liquid-vapor) system: Saturation curves, critical point, sub-cooled (compressed liquid), saturated liquid, wet vapor, saturated vapor, superheated vapor, quality (dryness fraction), moisture content using P-v diagram, T-v diagrams, P-h diagram, T-s diagram, and h-s diagram.

2.5 thermodynamics properties: Internal energy, Enthalpy, volume, Entropy, and specific heats

2.6 Tabulated data and Graphical data presentation

Unit 3: First law of Thermodynamics (9 hours)

3.1 Joule's experiment

3.2 Definition of the first law of thermodynamics: application to a process, cyclic process, and none cyclic process

3.3 Concept of control volume: first law applied to control volume, unsteady state, and steady-state analysis for control volume

3.4 control volume applications: work and flow applications for both steady and unsteady flow

3.5 other statement of the first law of thermodynamic

Unit 4: Second law of Thermodynamics (9 hours)

4.1 Drawbacks of the First law of thermodynamics

4.2 necessity of the second law of thermodynamics

4.3 statement of Second law of thermodynamics: Clausius, Plank kelvin, and their equivalence; other statements of second law of thermodynamics

4.3 Entropy: change of entropy for Ideal gas

4.4 causes of irreversibility

4.5 application of Second Law to Closed and Open Systems

4.6 derivation of governing equation for a reversible adiabatic process

4.7 Carnot cycle, Carnot theorem

4.8 Simple compressible refrigeration system, Heat pump, and heat engine

Unit 5: Thermodynamics cycles (9 hours)

5.1 operation of for stroke engine: suction stroke, compression stroke, expansion stroke, and exhaust stroke

5.2 classification of heat engine

5.3 Otto cycle, Diesel cycle, Brayton cycle open and closed), Rankine cycle: efficiency derivation

Unit 6: Heat Transfer (6 hours)

- 6.1 Definition compared to thermodynamics
- 6.2 basic modes of heat Transfer: Conduction, Convection and Radiation
- 6.3 Fundamental and subsidiary laws of heat transfer
- 6.3 Fourier law of heat conduction: application to steady state one dimensional for a plane wall and a hollow cylinder
- 6.4 Heat transfer through composite wall and composite cylinder
- 6.5 concept of thermal resistance: Electrical analog
- 6.6 concept of overall heat transfer coefficient: both for composite wall and composite cylinder
- 6.7 Convection: Natural or free and forced convection
- 6.8 thermal radiation
 - 6.8.1 Absorptivity, Reflectivity, transmissivity
 - 6.8.2 Concept of the black body, white body, opaque body, Grey body, and transparent body
 - 6.8.3 Stefan's law, concept of emissive power, emissivity

Practicals:

- 1. Temperature measurement
- 2. COP measurement for Refrigeration and Heat Pump
- 3. Measurement of thermal conductivity
- 4. Emissivity measurement

Textbook

- 1. R. D. Yadav, "A Text Book of Thermodynamics", Prativa Publication (P) Ltd.

References

- 2. M. C. Luitel, "Fundamental of Thermodynamics and Heat Transfer" Athrai Publication (P) Ltd.
- 3. R.K. Rajput, "Thermal Engineering" Laxmi Publications (P) Ltd., India
- 4. Dr. D.S. Kumar, "Thermal Science & Engineering", S.K. Kataria & Sons, India
- 5. Domkundwar Kothandaraman Domkundwar, "A course in Thermal Engineering", Dhanpat Rai & son, India
- 6. J.P. Holman, "Heat Transfer", McGraw-Hill

Distribution of marks:

The final evaluation will have questions from all the units. The marks distribution for all the units will be as follows:

		Scheduled Hours	Marks
Unit 1	Introduction and Energy Transfer	8	11
Unit 2	Properties of Simple Compressible Substance	7	9
Unit 3	The first law of Thermodynamics	8	11
Unit 4	The second law of Thermodynamics	8	11
Unit 5	Thermodynamics cycles	8	10
Unit 6	Heat Transfer	6	8
Total		45	60

Note: The marks distribution shown in the table above might be subjected to minor changes.

MATH-I CALCULUS AND LINEAR ALGEBRA

Course Code: MATH SH 101

Lecturer: 3

Tutorial:

Practical:

Year: 1

Part: I

Course Credit: 3

Objectives of the Course:

- Understanding the key concepts of limits and continuity and mastering techniques of differentiation and integration to use them solving geometrical and physical applications
- Understanding convergence and divergence of series and applying series expansions in engineering contexts
- Understanding matrices techniques to solve system of linear equations. Developing the concepts of vectors, vector space and vector subspace and their properties. Computing eigen-values and eigen-vectors of a matrix.

Credit Hours	Teaching Schedule Hours/Week			Evaluation Scheme				Total
				Internal Evaluation		Final Evaluation		
	Lecture	Tutorial	Practical	Theory	Practical	Theory	Practical	
3	3	2	-	40	-	60	-	100

Course Contents:

Unit 1: Function, Limit and continuity

[6 Hours]

- 1.1 Function, domain and range, graphs of few elementary functions
- 1.2 Piece-wise functions and their graphs
- 1.3 even and odd functions and their symmetric natures
- 1.4 Shifting and scaling a graph of a function
- 1.5 Limit of a function, Evaluating limits algebraically and graphically
- 1.6 One-sided limits, continuity and discontinuity, types of discontinuity,
- 1.7 Limits involving infinity, asymptotes, types of asymptotes lines (Horizontal, Vertical and oblique). Graphing of rational functions using asymptotes

Unit 2: Differentiation and its applications

[8 Hours]

- 2.1 Derivative at a point and its geometrical and physical interpretations
- 2.2 Proof of differentiability implies continuity
- 2.3 Second and higher order derivatives, Implicit differentiations
- 2.4 Tangent and normal lines on the curve, angles between the curves, Motion along a straight line, Related rates problems
- 2.5 Increasing/decreasing functions and first derivative test,
- 2.6 Local and absolute extreme values of a function

- 2.7 first derivative test of finding local extreme value(s) of a function
- 2.8 Concavity and second derivative test, second derivative test of finding local extreme value(s) of a function
- 2.9 Finding global extreme values(s) of a function
- 2.10 Statements of Rolle's and Mean value theorems and their geometrical interpretation and problems related to these theorems
- 2.11 Optimization problems

Unit 3: Integration and Its applications

[8 Hours]

- 3.1 Indefinite integrals and integration techniques.
- 3.2 Integration of involving $a^2 + x^2$, $\sqrt{a^2 + x^2}$, $a^2 - x^2$, $\sqrt{a^2 - x^2}$, $\sqrt{x^2 - a^2}$, $ax^2 + bx + c$, $\sqrt{ax^2 + bx + c}$, integration by partial fractions
- 3.3 Definite integrals and Definite integral as a Riemann sum.
- 3.4 Statements of the Fundamental Theorems of integral Calculus part I and part II and related problems
- 3.5 Solving first order and second order differential equations of types $\frac{dy}{dx} = f(x)$ with initial condition $y(x_0) = y_0$ and $\frac{d^2y}{dx^2} = g(x)$ with initial conditions $y(x_0) = y_0$ and $y'(x_0) = y_1$
- 3.6 Area under curves, area between the curves
- 3.7 Solid of revolution, Volumes of solid of revolution by disk method and washer method
- 3.8 Length of a curves, arc length of a curve, area of surface of revolution
- 3.9 Improper integrals of Type I and Type II
- 3.10 Beta and Gamma functions, Properties of the beta and gamma functions, reduction formulas

Unit 4: Infinite Sequences and Series

[6 Hours]

- 4.1 Infinite Sequence, convergence and divergence of an infinite sequence, calculating the limit of a sequence
- 4.2 Bounded and unbounded sequence, non-decreasing and non-increasing sequence, monotonic sequence
- 4.3 Infinite series and partial sums, convergence and divergence of an infinite series, nth term test for divergent series
- 4.4 Integral test for convergent or divergent series (statement only), convergence or divergence of p-series
- 4.5 Convergence test of an infinite series: Direct comparison test, Limit comparison test, ratio and root test, absolute convergent and absolute convergence test theorem,
- 4.6 Taylor and Maclaurin series of a function, Taylors polynomial of order n

Unit 5: System of Linear Equations

[5 Hours]

- 5.1 System of linear equations in the matrix form, consistent and inconsistent system, Elementary row operations and solution of the system using row operations methods
- 5.2 Row and reduced echelon forms of a matrix, pivot position and row reduction algorithm to convert the matrix into echelon forms
- 5.3 Existence and unique solution of the system, Parametrically represented solution of a system, homogeneous linear system of equations and unique and parametric solution representation

Unit 6: Vector Spaces

[7 Hours]

- 6.1 Vectors in $\mathbb{R}^2$ and geometrical description of $\mathbb{R}^2$, vectors in $\mathbb{R}^3$ and $\mathbb{R}^n$, algebraic properties of vectors in $\mathbb{R}^n$
- 6.2 Linear combination and span of the vectors in $\mathbb{R}^n$, Geometrical describing of span of vectors
- 6.3 Vector space and vector subspace, subspace spanned by a set of vectors, linearly independent and linearly dependent set of vectors, Basis and dimension of vector space
- 6.4 Linear transformation, kernel and range, null space, column space of a matrix, bases for null and column space, rank of a matrix

Unit 7: Eigen-values and Eigen-vectors

[5 Hours]

- 7.1 Eigen-values and eigen-vectors of a matrix, characteristic equations, eigen-values of triangular and diagonal matrices, Eigen-spaces
- 7.2 Diagonalization of a matrix

Text Books:

- 1. "Thomas' Calculus" by George B. Thomas Jr., Maurice D. Weir, and Joel R. Hass, Pearson India
- 2. Linear Algebra and Its Applications by David C. Lay, Pearson, India

Reference Books:

- 1. Advanced Engineering Mathematics" by Erwin Kreyszig, Wiley
- 2. Calculus: Early Transcendentals" by James Stewart, Publisher: Cengage Learning India
- 3. Introduction to Matrices and Linear Transformations by D. T. Finkbeiner, 3rd Edition CBS Publisher and Distributors, Delhi.
- 4. A Text Book of Calculus I by Narayan Prasad Pahari, Santosh Ghimire, Dr. Jeevan Kafle, Arun Kumar Bhandari, Madav Prasad Poudel, Prem Gurung, Durgesh Ojha, Publisher: Asmita Publication, Kathmandu, Nepal
- 5. A Text Book of Algebra and Geometry by Narayan Prasad Pahari, Santosh Ghimire, Dr. Jeevan Kafle, Arun Kumar Bhandari, Madav Prasad Poudel, Prem Gurung, Durgesh Ojha, Publisher: Asmita Publication, Kathmandu, Nepal
- 6. A Text Book of Linear Algebra by Tulasi Prasad Nepal, Tek Bahadur, Budhathoki, Jeevan Kafle. Publisher: Heritage Publishers and Distributors Pvt. Ltd., Kathmandu, Nepal
- 7. A Text Book on Engineering Mathematics Volume I by S. P. Shrestha, H. D. Chaudhary, P. R. Pokharel. Publisher: Vidyarthi Pustak Bhandar, Kathmandu, Nepal
- 8. A Text Book on Engineering Mathematics Volume III by P. R. Pokharel, H. D. Chaudhary, S. P. Shrestha. Publisher: Vidyarthi Pustak Bhandar, Kathmandu, Nepal

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Evaluation Scheme:

The final evaluation will have questions from all the units. The marks distribution for all the units will be as follows:

Units	Topics	Scheduled Hours	Marks
1	Function, Limit and Continuity	6	8
2	Differentiation and Its Applications	8	11
3	Integration and Its Applications	8	11
4	Infinite Sequences and Series	6	8
5	System of Linear Equations	5	7
6	Vector Spaces	7	8
7	Eigenvalues and Eigenvectors	5	7
Total		45 Hours	60 Marks

Note: The marks distribution shown in the table above might be subjected to minor changes.

ENGLISH PROFICIENCY

Course Code: SH 102

Lecturer: 3

Tutorial: 2

Practical: 1

Year: I

Part: I

Course Credit: 3

Course Objectives:

The course aims to provide effective communicative language skills to professional students engaged with professional courses like Engineering. This course enables students to use language accurately, clearly, and concisely in their academic and professional careers. It also enhances the capacity of students to read a text critically and improve their work-related writing skills that help them grow professionally.

	Teaching Schedule Hours/Week			Evaluation Scheme				
				Internal Evaluation		Final Evaluation		Total
	Lecture	Tutorial	Practical	Theory	Practical	Theory	Practical	
Cr	3	2	1	40	10	60	15	

Course Contents:

Unit 1 Vocabulary

(3 Hours)

- ### 1.1. Sets of vocabulary applied in the Engineering profession with Exercises

Unit 2 Grammar Essentials

(8 Hours)

- 2.1. Introduction: Grammar Essentials for Engineering Communication
- 2.2. Parts of Speech
- 2.3. Tense
- 2.4. Voice
- 2.5. Reported Speech
- 2.6. Subject-Verb Agreement
- 2.7. Preposition

Unit 3 Reading Comprehension

(3 Hours)

- 3.1. Comprehension questions and exercises (from prescribed passages- Engineering Construction, Foundations, Doors, Windows, Staircase, Bridges, Irrigation, Highway, Railway, Airport, etc)
- 3.2. Note-Making
- 3.3. Abstract/Precis/Summary Writing

Unit 4 Graphical Proficiency

(2 Hours)

Unit 5 Writing

(21 Hours)

- 5.1. Writing Notices with Agenda and Minutes
- 5.2. Email Writing
- 5.3. Writing Proposals
 - 5.3.1. Introduction: Proposal Writing in Engineering Profession
 - 5.3.2. Purpose of the Proposal Writing
 - 5.3.3. Structuring the Proposal
 - 5.3.4. Clarity and Conciseness in Proposal
 - 5.3.5. Demonstrating Feasibility
 - 5.3.6. Professionalism in Proposals
 - 5.3.7. Peer Review and Revision
- 5.4. Report Writing
 - 5.4.1. Introduction: Report Writing in Engineering Profession
 - 5.4.2. Types of Formal Report
 - 5.4.3. Anatomy of Formal Report

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- 5.4.4. Progressive Reports
- 5.4.5. Feasibility Reports
- 5.4.6. Empirical/Research Reports
- 5.4.7. Field/Project Reports
- 5.5. Writing Research Article
 - 5.5.1. Understanding the Research Article Structure
 - 5.5.2. Crafting an Engaging Introduction
 - 5.5.3. Detailing Research Procedures
 - 5.5.4. Presenting Research Findings Effectively
 - 5.5.5. Navigating the Results and Discussion Sections
 - 5.5.6. Writing Conclusions in a Research Article
- 5.6. Issue Essay
 - 5.6.1. Deconstructing the Issue Prompt
 - 5.6.2. Developing a Clear Thesis Statement
 - 5.6.3. Building a Coherent Argument
 - 5.6.4. Selecting and Presenting Evidence
 - 5.6.5. Addressing Counterarguments
 - 5.6.6. Writing Style and Clarity
 - 5.6.7. Writing Conclusion of an Essay

Unit 6 Listening

(4 Hours)

Unit 7 Speaking

(4 Hours)

Reference:

1. Adhikari, B.D., and Lamichhane, P. "Modern English Grammar, Writing, Comprehension, Word Formation and Pronunciation", Heritage Publishers and Distributors, Kathmandu.
2. Adhikari, Usha; et.al. (2000) "Communicative Skills in English", Research Training Unit, IOE, Pulchowk Campus.
3. Khanal, Ramnath, (2008) "Need-based Language Teaching (Analysis in Relation to Teaching of English for Profession Oriented Learners)" Kathmandu: D, Khanal.
4. Mishra, Sunita et. al. (2004), "Communication Skills for Engineers", Pearson Education First Indian print.
5. Rizvi, M. Ashraf (2008), "Effective Technical Communication", Tata Mc Graw Hill.
6. Taylor, Shirley et. al. (2009), "Model Business Letters, E-mails & other Business Documents", Pearson Education.
7. Adhikari, O. "A Text Book of English- Engineering Your English",...

Evaluation Scheme

The final evaluation will have questions from all the units. The marks distribution for all the units will be as follows:

Unit	Unit Title	Scheduled Hours	Marks Distribution
1	Vocabulary	3	5
2	Grammar Essentials	8	10
3	Reading Comprehension	3	5
4	Graphical Proficiency	2	5
5	Writing	21	35
6 & 7	Listening and Speaking	8	Practical
Total		45	60

Note: The marks distribution in the table above can be modified according to the need.

ENGINEERING DRAWING-I**Course Code: ME 102****Lecturer: 1****Tutorial:****Practical: 3****Year: 1****Part: 1****Course Credit: 1**

Course Objectives: This course is designed to provide knowledge and skill on points, lines, planes and geometrical solids. To draw projections, drawings of various geometric figures. Also to develop ability of preparing working drawings.

	Teaching Schedule Hours/Week			Evaluation Scheme				
				Internal Evaluation		Final Evaluation		Total
	Lecture	Tutorial	Practical	Theory	Practical	Theory	Practical	
Cr	1	-	3	-	60	-	40	100

Course Contents:**Unit 1. Introduction of Engineering Drawing****(2 Hours)**

1.1 Types of drawing i. e Engineering drawing and artist drawing and engineering drawing is the universal language of Engineering technical person.

1.2 Introduction of drawing material i.e drawing as drawing paper, drawing board , , adhesive tape, pencil, eraser, sharpener etc.

1.3 Drawing instrument i .e drawing board, drawing paper, T-square, set square, protector, drafting machine, instrument box, scale, french Curves etc.

Unit 2. Lettering**(2 Hour)**

2.1 Introduction of the single stroke letter and their ratio between height and breadth.

2.2 Introduction of the upper and Lower case letter.

Unit 3. Scale and Dimensioning**(4 Hour)**

3.1 Introduction of the scale and importance.

3.2 Types of scale (full ,reducing and enlarge)

3.3 Introduction of dimensioning

3.4 Terminology of dimension

3.5 Dimensioning system i.e aligned system unidirectional system and baseline dimensioning.

3.6 Principles of dimensioning.

Unit 4. Applied geometry**(10 Hour)**

4.1 plane geometrical construction:

Proportional division of line, division of a circle, division of angle, division of triangle, arc and line tangents

4.2 Method for drawing standard curve such as ellipses, parabolas, hyperbolas, involutes, spirals, cycloids and helices.

4.3 Techniques to reproduce a given drawing (by construction)

Unit 5. Basic descriptive geometry**(22Hour)**

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- 5.1 Introduction to orthographic projection, principle plane ,four quadrant or angle.
- 5.2 Projection of point on 1st, 2nd, 3rd and 4th quadrants, system of orthographic projection, making of orthographic view, analysis of object and its view.
- 5.3 projection of lines: parallel to the one of the principal plane inclined to one of the principal plane and parallel to other, inclined to both principal planes.
- 5.4 projection of planes: perpendicular to the both principal planes, parallel to one of the principal planes and inclined to one of the principal planes, perpendicular to other and inclined to both principal planes.
- 5.5 True length of the line: horizontal , inclined and oblique lines.
- 5.5 Rules for parallel and perpendicular lines.
- 5.6 Point view or end view of line.
- 5.7 Edge view and true shape of an oblique planes.
- 5.8 Angle between two intersecting lines
- 5.9 Intersection of a line and a plane.
- 5.10 Angle between a line and a plane.
- 5.11 Dihedral angle between two planes.
- 5.12 Shortest distance between the two skew lines.
- 5.13 Angle between two non-intersecting skew lines.

Unit 6. Multi view (orthographic) projection

(20 Hour)

- 6.1 perspective projection drawing, orthographic projections , Aonometric projection, oblique projection, first and third angle projection.
- 6.2 principal views: method for obtaining orthographic views, projection of Lines, angle and plane surfaces, analysis in the three view, projection of the curved line and surface, object orientation and selection of the view for representation, Orthographic drawing making an orthographic drawing visualizing object from the given views, interpolation of adjacent area.
- 6.3 sectional views: full, half, broken revolved, removed (detail) sections, Phantom of hidden sections, axillary sectional views, specifying cutting planes for Sections, conventional for hidden lines, holes, ribs, spokes
- 6.5 Auxiliary view: Basic concept and use, drawing method and types, symmetrical and unilateral auxiliary views. projection of the curved lines and boundaries, line of intersection between two planes, true size of dihedral angles, true size and shape of plane surfaces.

Practical 3 hour/week: 15 weeks

Sheets:-

1. Drawing sheet layout, freehand lettering, sketching of parallel lines, circles dimensioning.
2. Perform dimensional practicing exercise on aligned, unidirectional, title block and base line dimensions.
3. Perform line: bisection, trisection line division any number of parts, with a proportional division, circle division in the three, four, five, six, seven and eight parts, area of triangle and trapezoid division any number of equal parts.
4. Draw tangent from any point on circle, open and closed line tangent. Arc tangent-internal, external and combined.
5. Ellipse- concentric circle, oblong (rectangle) foci and eccentricity method.

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6. Hyperbola-rectangular and t transverse axis method.
7. Parabola-rectangle, offset,transverse axis method.
8. Involute, spiral construction cycloid, helices.
9. Descriptive geometry -projection of point and lines (sketch and instrumental drawing)
10. Plane of projection- perpendicular to one plane and parallel to the other, perpendicular to the both the planes, perpendicular to one plane and inclined to the others.
11. Solid projection- Orthographic projection of simple geometrical solid in first and third angle projection.
12. Multiview, sectional drawing and dimensioning (sketch and instrumental drawing)
13. Auxiliary view, sectional drawing and dimensioning (sketch and instrumental drawing)
14. Analyze the view and draw orthographic projection of flat, inclined and circular surfaced model of the given objects.

References:

1. Luzzadar W. I Fundamental of Engineering drawing. Prentice-Hall of India
2. S. Bogolyubov and A. Voinov, Engineering drawing. Mir Publishers, Moscow.
3. S. K Bogolyubov, Exercises in Machine Drawing. Mir publishers, Moscow.
4. K. Venugopal Engineering Drawing and Graphics, New age international (p) Ltd. India
5. Gill. P. S. Engineering Drawing, S. K. Kataria and sons India.
6. M. B. Shah and B.C. Rana, Engineering Drawing, Pearson India,
7. N. A and Panchal V.M. Engineering Drawing Charotar D. Bhatt publishing House India.
8. A Text Book of engineering Drawing" R.. K Dhawan , S. Chand and Company Limited.

Evaluation Scheme

The question will be cover all the chapter in the syllabus. The evaluation scheme will be as indicated in the table below:-

Chapter	Hours	Mark distribution
1, 2	4	3 to 5
3	4	3 to 5
4	10	5 to 7
5	22	15
6	20	10
Total	60	40

- **There may be minor deviation in marks distribution.**

ENGINEERING CHEMISTRY
Course Code: SH 103

Lecturer: 3
Tutorial: 1
Practical: 2

Year: I
Semester: I
Course Credit: 3

Course Description

This course provides an overview of chemistry in Bachelor of Engineering. The students will be able to strengthen their knowledge on general chemistry, corrosion, electrochemistry, water analysis and treatments and polymers.

Objectives of the Course

- To strengthen the fundamental concept of chemistry.
- To introduce the application of chemistry in engineering field.
- To familiarize the students with chemistry and its usage in daily life of household and industry.

Unit-1 Ionic Equilibrium (5Hrs)

- 1.1 Ostwald's Dilution Law
- 1.2 pH and pH-scale
- 1.3 Buffer solution: Acidic Buffer, Basic Buffer and their mechanism
- 1.4 Derivation of Henderson's equation for pH calculation of buffer solution
- 1.5 Related Numerical Problems

Unit-2 Electrochemistry (6Hrs)

- 2.1 Electrolytic and Galvanic Cell
- 2.2 Standard Hydrogen Electrode
- 2.3 Nernst's equation
- 2.4 Determination of pH using glass electrode
- 2.5 Corrosion of metal, electrochemical series and Prevention of rusting
- 2.6 Related Numerical Problems

Unit-3 Catalysis (4Hrs)

- 3.1 Catalysis, Positive, Negative, Auto and Induced Catalysis
- 3.2 Types of Catalysis: Homogeneous and Heterogeneous catalysis

3.3 Characteristics of a catalyst

3.4 Action of catalyst (Catalytic promoter and catalytic poisoning)

3.5 Criteria for Choosing a Catalyst for Industrial Applications

3.6 Theories of Catalysis: Intermediate Compound Formation Theory and Adsorption Theory

Unit-4 Transition Metals (3d Series-4Hrs)

4.1 Periodic Properties of Transition Metals

4.2 Characteristics and properties of Transition metals

4.3 Variable Oxidation States

4.4 Complex formation and Magnetic properties.

4.5 Colour formation

4.6 Alloy Formation

4.7 Applications of 3-d transition elements

Unit-5 Coordination Complexes (4Hrs)

5.1 Introduction of Co-ordination complexes and Double salts

5.2 Differences between Co-ordination complexes and Double salts

5.3 Werner's co-ordination theory

5.4 Sidgwick model

5.5 Nomenclature of co-ordination complex (Neutral type, simple cation and complex anion and complex cation and simple anion type, complex anion and complex cation type)

5.6 Valence bond theory (VBT)

5.7 Structure and magnetic properties of tetrahedral complexes, square planar complexes and octahedral complexes (inner and outer complex, high spin and low spin complexes)

Unit-6 Organic Reactions (4Hrs)

6.1 Substitution Reactions (SN1 and SN2 Reactions)

6.2 Elimination Reactions (E1 and E2 Reactions)

6.3 Addition Reactions

6.4 Re-arrangement Reactions with examples

Unit-7 Engineering Polymers (5Hrs)

7.1 Polymers and their type

7.2 General Properties of Inorganic Polymers

7.3 Preparation and applications of Chalcogenide glasses, Silicones and Polyphosphazenes

7.4 Synthetic Polymer :, Polystyrene, Nylon6.6, PTFE , Bakelite, Fiber reinforced Plastics (FRP)- Preparation and their uses

7.5 Introductions to Conducting Polymers and Bio-degradable Polymers

7.6 Natural Rubber and Synthetic rubber, neoprene, buna rubber and vulcanization of rubber

Unit-8 Explosives, Paints and Lubricants (4Hrs)

8.1 Introduction to explosives,

8.2 Their characteristics and types (Low explosives and High explosives)

8.3 Preparation, properties and action of TNT, TNG, RDX, PETN and Nitrocellulose, Nitroglycerin.

8.4 Paints their Types, properties and applications

8.5 Lubricants, their Types, properties and applications

Uni- 9 Environmental Chemistry (4Hrs)

9.1 Air Pollution

9.2 Air Pollutants (Particulates and Gaseous) and their sources (SPM, Fly Ashes, dust, SO_x , NO_x , CO , CO_2 and O_3)

9.3 Impacts of air pollutants and their control measure

9.4 Acid Rain, Global Warming (Green House Effect) Ozone depletion & its photochemistry

9.4 Water Pollution and Types of Water Pollutants

9.5 Sources of water pollution, their impacts and possible remedies for their control.

9.6 Soil Pollution and soil pollutants. Sources of soil pollution, their impacts and solutions for their control measures.

Unit-10 Water Analysis and Treatment (4Hrs)

10.1 Introduction, Sources of Water, Soft water, Hard water

10.2 Physical and Chemical Analysis of water: Colour, Odour, TDS, pH, Alkalinity, Total Hardness, Free Residual Chlorine, Iron, Ammonia, Lead, Arsenic, Dissolved Oxygen, COD, BOD.

10.3 Water Treatment for Municipal Supply

10.4 Waste Water Treatment and Disposal

References

1. Engineering Chemistry by Jain and Jain
2. A Text Book of Engineering Chemistry by SS Dara and SS Umare
3. A New Concise Inorganic Chemistry by J.D. Lee
4. A Text Book of Engineering Chemistry by BP Panthi and RK Sharma
5. Organic chemistry by Morrison and Boyd
6. Selected Topics in Physical Chemistry by Moti Kaji Sthapit
7. Environmental Chemistry by AK De
8. Engineering Chemistry by Arjun Paudel & Arun Pd. Chaudhary
9. Engineering Chemistry by PR Vijaysarathi
10. A Core Experimental Chemistry by PN Yadav, NM Khadka, SD Gautam

Laboratory Works (2 Periods/week)

Students are supposed to perform at least five practical out of provided syllabus.

1. To determine the alkalinity of the given sample of water (sample A and B)
2. To determine the total hardness of water sample.
3. To determine the amount of Free Residual Chlorine in the given sample of water.
5. To determine the Iron from Mohr's salt.
6. To determine percentage of Alumina (Al_2O_3) in Aluminum Sulphate(Alum).
7. To Prepare distemper paint and test its properties.
- 8 .To Estimate the amount of COD in the given sample of water.
9. To Prepare Bakelite/nylon 6,6
10. To Prepare and determine the pH of unknown buffer by using standard buffer solution.

Evaluation Scheme

Credit Hours	Teaching Schedule Hours/Week			Evaluation Scheme				
				Internal Evaluation		Final Evaluation		Total
	Lecture	Tutorial	Practical	Theory	Practical	Theory	Practical	
Cr	4	1	2	40	10	60	15	125

There will be questions covering all the chapters in the syllabus. The evaluation scheme for the question is indicated in the table below.

Chapter	Lecturer Hours/Week	No. of Questions	Total Marks
1	5	1	5
2	6	2*	10
3	4	1	5
4	4	1*	5
5	5	2	10
6	4	1	5
7	5	1	5
8	4	1*	5
9	4	1	5
10	4	1	5
Total	45	12	60

Note: All questions should be attempt. However, one alternate question will be asked from chapter two, four and eight as shown by asterisk in the above table.

*Slight variation may in Questions number in above table.

COMPUTER PROGRAMMING

Course Code: CT101

Lecture Hours: 3
Tutorial: 1
Practical: 3

Year: I
Part: I
Course Credit: 3

Teaching schedule Hours/week				Examination scheme			Total Marks
				Internal		Final	
Cr	Theory	Tutorial	Practical	Theory	Practical	Theory	150
	3	1	3	40	50	60	

LEARNING OBJECTIVES:

The educational objectives of this course are

1. To focus the basic architecture and Fundamentals of Computers and Peripherals.
2. To Introduce programming language and aware the students about programming paradigm.
3. Apply programming constructs of C language to solve the real-world problems.
4. To give clear idea of different strategy of basic programming with C like Looping, Decision Making, Array, Structure, Function, Pointer, etc. to solve real life problems.

Unit 1: Introduction to computer and Programming Language (6 hrs)

Introduction, Basic block diagram and functions of various components of computer, Concept of Hardware and Software, Types of software, Compiler and Interpreter, Concepts of Machine level, Assembly level and High level programming, structured programming, Problem analysis (requirement analysis, program design, program coding, program testing, software installation and maintenance), Algorithms and Flowchart.

Unit 2: Basics of C Programming (6 hrs)

Features of C language, structure of C program, Character set, C Tokens, Identifiers and Keywords, comments, header files, data types, symbolic constants, constants and

variables, operators, expressions, evaluation of expressions, type conversion, precedence and associativity, I/O functions.

Unit 3: Input and Output (2 hrs)

Conversion specification, Reading a character, Writing a character, I/O operations, Formatted I/O, Unformatted I/O.

Unit 4: Decision Making – Branching & Looping (6 hrs)

Simple statements, Decision making statements, Looping statements, Nesting of control structures, switch statement, goto statement, Jumps in loops.

Unit 5: Array & String (6 hrs)

Introduction to Array, Types of Array (Single Dimensional and Multidimensional), Declaration and Memory Representation of Array, Initialization of array, Character Array and Strings, Reading and Writing Strings, Null Character, String Library Functions

Unit 6: Functions and pointers (6 hrs)

Top down approach of problem solving, standard library functions, passing values between functions, calling convention, return type of functions, recursive functions, Local and Global Variable, Pointers, Pointer operators, Pointer arithmetic, Arrays and pointers, Array of pointers, call by value and call by reference.

Unit 7: Structure and Union (6 hrs)

Introduction, Array of structure, Passing structure to function, Passing array of structure to function, Structure within structure (Nested Structure), Union, Pointer to structure.

Unit 8: File Management (4 hrs)

Introduction to file management, Simple file management functions for text files, Reading from and writing to files, Creating and Operating file in different Modes.

Unit 9: Graphics (3 hrs)

Initialization, Graphical mode, Simple program using built in graphical function.

Evaluation Scheme:

Chapter	Hours	Mark distribution*
1	6	6
2	6	6
3	2	4
4	6	8
5	6	10
6	7	10
7	5	6
8	4	6
9	3	4
Total	45	60

There may be minor deviation in marks distribution.

RECOMMENDED STUDY MATERIAL:

Text Books:

1. Programming in ANSI C, Forth Edition, E Balagurusamy, TMH
2. Byron Gottfried: "Programming with C," , Second Edition, McGraw Hill Education.

Reference Books:

1. Let us C, Yashwant Kanitkar
2. Paul Deitel, Harvey Deitel, C: How to Program, Eighth Edition, Pearson Publication.
3. Al Kelley, Ira Pohl: "A Book on C", Fourth Edition, Pearson Education.
4. Brian W. Keringhan, Dennis M. Ritchiem, The C programming Language, Second Edition, PHI Publication.

Laboratory

- Minimum 8 sets of computer programs in C (from Unit 2 to Unit 9) should be done individually. (30 marks out of 50 marks)

- Student (maximum 4 persons in a group) should submit mini project at the end of

S. No.	List of Practicals	3hrs/week
1	Basic Introduction to C program and C setup(Compile/Run program)	
2	Simple program using scanf/printf	
3	Program using operators	
4	Program using if/else	
5	Switch case programs	
6	Programs of loops(for, while loop)	
7	Programs of loops(do...while loop)	
8	Program of Nested loops(patterns using for loop)	
9	Simple program of one-Dimensional array	
10	Programs of two-dimensional array(addition/multiplication of matrix)	
11	Programs of multi-dimensional array	
12	Programs using go to statements	
13	String Programs(using string function)	
14	String Programs(without using string function)	
15	Program of Functions(no parameter ,no return value)	
16	Program of Functions(parameter, no return value)	
17	Program of Functions(no parameter, return a value)	
18	Program of Functions(parameter, return value)	
19	Program for scope of functions(global, local, static ,register)	
20	Program of array and function	
21	Simple program of structure(read values and display the values)	
22	Program of structure using functions	
23	Program of structure using pointers	
24	Simple program using pointer(display value and its address)	
25	Program of pointer and array	
26	Program of pointer using function	
27	Program of pointer and structure	
28	Program of pointer and string	
29	Program to read data from file and write into a file	
30	Simple program using built in graphical function	

course. (20 marks out of 50 marks)

BACHELOR DEGREE IN CIVIL ENGINEERING