I. K. Gujral Punjab Technical University, Punjab B.E./B.Tech CSE Sem 1 syllabus

Maths-I

Unit-I: Calculus

Rolle’s theorem, Mean value theorems, Taylor’s and Maclaurin theorems with remainders;
Indeterminate forms and L' Hôpital's rule; Maxima and minima; Evaluation of definite and
Improper integrals; Applications of definite integrals to evaluate surface areas and volumes of
revolutions.

Unit-II: Multivariable Calculus

Limit, continuity and partial derivatives, Total derivative; Tangent plane and normal line;
Maxima, minima and saddle points; Method of Lagrange multipliers; Multiple Integration:
double and triple integrals (Cartesian and polar), change of order of integration in double
integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double
integration), Center of mass and Gravity (constant and variable densities).

Section-B

Unit-III: Sequences and Series

Convergence of sequence and series, tests for convergence of positive term series: root test,
ratio test, p-test, comparison test; Alternate series and Lebinitz’s test; Power series, Taylor's
series, series for exponential, trigonometric and logarithmic functions.

Unit-IV: Matrices

Algebra of matrices, Inverse and rank of a matrix, introduction of null space and kernel,
statement of rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and
orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Similar matrices;
Diagonalization of matrices; Cayley-Hamilton Theorem.

Suggested Text/Reference Books

G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,
Reprint, 2002.
Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,
2006.
T. Veerarajan, Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi, 2008.
B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint,
2010.
D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications,
Reprint, 2008.
B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Programming for Problem Solving

Unit 1

Introduction to Programming
Introduction to components of a computer system (disks, memory, processor,
where a program is stored and executed, operating system, compilers etc.) –
Idea of Algorithm: steps to solve logical and numerical problems. Representation of
Algorithm: Flowchart/Pseudocode with examples.
From algorithms to programs; source code, variables (with data types) variables and memory

locations, Syntax and Logical Errors in compilation, object and executable code-

Unit 2
Arithmetic expressions and precedence
Conditional Branching and Loops
Writing and evaluation of conditionals and consequent branching
Iteration and loops

Unit 3
Arrays
Arrays (1-D, 2-D), Character arrays and Strings

Unit 4
Basic Algorithms
Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding
roots of equations, notion of order of complexity through example programs (no
formal definition required)

Unit 5
Function
Functions (including using built in libraries), Parameter passing in functions, call
by value, Passing arrays to functions: idea of call by reference

Unit 6
Recursion
Recursion, as a different way of solving problems. Example programs, such as Finding
Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 7
Structure
Structures, Defining structures and Array of Structures

Unit 8

Pointers
Idea of pointers, Defining pointers, Use of Pointers in self-referential structures,
notion of linked list (no implementation)

Unit 9
File handling

TextBooks
(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
Reference Books
(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice
Hall of India.

English

Unit-1 Vocabulary Building & Basic Writing Skills
The concept of Word Formation
Root words from foreign languages and their use in English
Acquaintance with prefixes and suffixes from foreign languages in English to
form derivatives.
Synonyms, antonyms, and standard abbreviations.
Sentence Structures
Use of phrases and clauses in sentences
Importance of proper punctuation
Creating coherence
Organizing principles of paragraphs in documents
Techniques for writing precisely
Unit-2 Identifying Common Errors in Writing
Subject-verb agreement
Noun-pronoun agreement
Misplaced modifiers
Articles
Prepositions
Redundancies
Clichés
Unit-3 Mechanics of Writing
Writing introduction and conclusion

Describing
Defining
Classifying
Providing examples or evidence

Unit-4 Writing Practices

Comprehension
Précis Writing
Essay Writing
Business Writing-Business letters, Business Emails, Report Writing, Resume/CV

Suggested Readings:

(i) Practical English Usage. Michael Swan. OUP. 1995.
(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007
(iii) On Writing Well. William Zinsser. Harper Resource Book. 2001
(iv) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
(v) Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press.
2011.
(vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University
Press

Basic Electrical Engineering

Module 1: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and
voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin's and
Norton's Theorems. Time-domain analysis of first-order RL and RC circuits.

Module 2: AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real
power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-
phase balanced circuits, voltage and current relations in star and delta connections.

Module 3: Electrical Machines

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

Module 4: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB), MCCB, Contactors, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Text / Reference Books

D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.

T.K. Nagsarkar and M.S. Sukhija, “Basic Electrical Engineering”, Oxford University Press

D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.

E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.

V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

B. L. Theraja, “Electrical Technology”, S Chand Publishing

J. B. Gupta, “Basic Electrical Engineering”, S.K. Kataria & Sons

Engineering Graphics & Design

Course code BTME101-18
Category Engineering Science Courses
Course title Engineering Graphics & Design

Credits 3

Module 1: Introduction to Engineering Drawing covering,
Principles of Engineering Graphics and their significance, usage of Drawing instruments,
lettering, Conic sections including the Rectangular Hyperbola (General method only);
Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

Module 2: Orthographic Projections covering,
Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined
to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Module 3: Projections of Regular Solids covering,
those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning
and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink,
shower, etc.

Module 4:Sections and Sectional Views of Right Angular Solids covering,
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right
Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views
of geometrical solids, objects from industry and dwellings (foundation to slab only)

Module 5: Isometric Projections covering,

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions;
Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric
Views to Orthographic Views and Vice-versa, Conventions;

Module 6: Overview of Computer Graphics covering,
listing the computer technologies that impact on graphical communication, Demonstrating
knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard,
Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs,
Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The
Command Line (where applicable), The Status Bar, Different methods of zoom as used in
CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound
Solids];

Module 7: Customisation & CAD Drawing
consisting of set up of the drawing page and the printer, including scale settings, Setting up
of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and
tolerancing; Orthographic constraints, Snap to objects manually and automatically;
Producing drawings by using various coordinate input entry methods to draw straight lines,
Applying various ways of drawing circles;

Module 8: Annotations, layering & other functions covering
applying dimensions to objects, applying annotations to drawings; Setting up and use of layers,
layers to create drawings, Create, edit and use customized layers; Changing line lengths through
modifying existing lines (extend/lengthen); Printing documents to paper using the print
command; orthographic projection techniques; Drawing sectional views of composite right
regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective,
isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning
guidelines, tolerancing techniques; dimensioning and scale multi

views of dwelling;

Module 9: Demonstration of a simple team design project that illustrates
Geometry and topology of engineered components: creation of engineering models and their
presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed
topologies for engineering analysis and tool-path generation for component manufacture;
geometric dimensioning and tolerancing; Use of solid-modeling software for creating
associative models at the component and assembly levels; floor plans that include: windows,
doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to
building drawing practice; Drawing sectional elevation showing foundation to ceiling;
Introduction to Building Information Modelling (BIM).

Suggested Text/Reference Books:
(i) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar
Publishing House
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics,
Pearson Education
(iii) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
(iv) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech
Publishers
(v) (Corresponding set of) CAD Software Theory and User Manuals
Course Outcomes

Chemistry-I

(i) Atomic and molecular structure (12 lectures)

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic

molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

(ii) Spectroscopic techniques and applications (8 lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

(iii) Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

(iv) Use of free energy in chemical equilibria (6 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

(v) Periodic properties (4 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

(vi) Stereochemistry (4 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality,

enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

(vii) Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Suggested Text Books

(i) University chemistry, by B. H. Mahan (ii) Chemistry: Principles and Applications, by M. J. Sienko and R.A. Plane (iii) Fundamentals of Molecular Spectroscopy, by C. N. Banwell (iv) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan (v) Physical Chemistry, by P. W. Atkins (vi) Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Mechanics of Solids

BTPH101-18 Mechanics of Solids

4 Credits

UNIT I: Vector mechanics
Physical significance of gradient, Divergence and curl. Potential energy function, F = - Grad V, equipotential surfaces, Forces in Nature, Newton’s laws and its completeness in describing particle motion, Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum and Energy, Introduction to Cartesian, spherical and cylindrical coordinate system, Inertial and Non-inertial frames of reference; Rotating coordinate system :- Centripetal and Coriolis accelerations.

UNIT II: Simple harmonic motion, damped and forced simple harmonic oscillator
Mechanical simple harmonic oscillators, damped oscillations, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical oscillators, resonance.

PART-B

UNIT III: Planar rigid body mechanics

Definition and motion of a rigid body in plane; Rotation in the plane, Angular momentum about a point of a rigid body in planar motion; center of mass, moment of inertia, theorems of moment of inertia, inertia of plane lamina, circular ring, moment of force, couple, Euler's laws of motion.

UNIT IV: Mechanics of solids

Friction: Definitions: Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; motion on horizontal and inclined planes. Methods of reducing friction, Concept of stress and strain Bat a point; Concepts of elasticity, plasticity, strain hardening, failure (fracture/yielding), one dimensional stress-strain curve; Generalized Hooke's law. Force analysis — axial force, shear force, bending moment and twisting moment. Bending stress; Shear stress; Concept of strain energy; Yield criteria.

Reference books and suggested reading:

1. Engineering Mechanics, 2nd ed. - MK Harbola, Cengage Learning India, 2013.
2. Introduction to Mechanics - MK Verma, CRC Press Book, 2009.
3. Mechanics- DS Mathur, S Chand Publishing, 1981.
4. An Introduction to Mechanics - D Kleppner & R Kolenkow, Tata McGraw Hill 2009.
5. Principles of Mechanics - JL Synge & BA Griffiths, Nabu Press, 2011.
6. Mechanics - JP Den Hartog, Dover Publications Inc, 1961.
7. Engineering Mechanics- Dynamics, 7th ed. - JL Meriam, Wiley.
8. Theory of Vibrations with Applications -WT Thomson, Pearson.
9. An Introduction to the Mechanics of Solids, 2nd ed. with SI Units- SH Crandall, NC Dahl & TJ Lardner
10. Classical Mechanics- H. Goldstein, Pearson Education, Asia.
11. Classical mechanics of particles and rigid bodies-K.C Gupta, Wiley eastern, New Delhi.
12. Engineering Physics-Malik and Singh, Tata McGraw Hill.
13. Engineering Mechanics: Statics- 7th ed.-JL Meriam, Wiley, 2011.
14. Analytical Mechanics-Satish K Gupta, Modern Publishers.