Engineering and Technology,
R.T.M. Nagpur University, Nagpur.
Syllabus for B.Tech. Chemical Technology

(Second Semester)

Engineering Mathematics – II (CT (BGE) 2.01)

(Total Credits: 04)

Teaching Scheme
Lectures: 3 Hours/ Week
Tutorial: 1 Hours/ Week

Examination Scheme
T (U) : 80 Marks  
T (I) : 20 Marks
Duration of University Exam. : 03 Hours

UNIT - I: Ordinary differential Equation and Higher Order Differential Equation


UNIT - II: Fourier Series

Fourier series , expansion of function ,Even and odd function, Half range fourier series, Change of interval, Harmonic analysis.

UNIT - III: Series Solution

Method of infinite series solution for ordinary D. E. when x = 0 as a ordinary point & x = a as a regular singular point

UNIT - IV: Special Function

Bessel's equation, Bessel’s functions: recurrence relations, orthogonality property, generating function, Legendre's equation, Legendre Polynomials: Rodrigue’s formula generating function, recurrence relations, orthogonality property,

UNIT - V: Vector Calculus

Definition of vector scalar function & vector point function , gradient ,directional derivative , divergence and curl , Line , surface and volume integral , Gauss divergence theorem , Stokes Theorem and Green theorem( excluding proof) .
UNIT – VI : Difference equation and Numerical Method

A) Homogeneous and non – homogeneous differential equation with constant coefficient, first order linear difference equation with constant coefficient.

B) Numerical solution of ordinary and higher differential equation: Picard method, Euler’s method, Taylors method and Runge – Kutta method

Books Recommended:

2. A text book of engineering mathematics by N.P. Bali, Manish Goyal
(Second Semester)

Applied Organic Chemistry (CT (BGE) 2.02)

(Total Credits: 03)

Teaching Scheme

Lectures: 2 Hours/ Week
Tutorial: 1 Hours / Week

Examination Scheme

Theory

T (U) : 80 Marks  T (I) : 20 Marks

Duration of University Exam. : 03 Hours

Unit 1 Aromatic hydrocarbon  Preparation, properties and Industrial uses, and its structure determination of Benzene, Naphthalene.
Alcohol - monohydric alcohol. e.g. ethyl alcohol, di hydric alcohol. e.g. ethylene glycol, trihydric alcohol e.g. glycerol.-its study. Preparations, properties and Industrial uses.
Heterocyclic hydrocarbon- total synthesis, preparations, properties and uses of Pyrrole, Indigo.

Unit 2 Carbohydrates Industrial uses and structure determination of glucose, saccharin.
Acids and esters Preparations and properties and uses of Acetic acid, Acetoacetic acid, Malonic acid and their esters.
Amines- Preparations and properties and uses of mono-, di -, tri- ethyl amines .Aniline and diazotization with special reference to formation of azo dyes - e.g. Aniline yellow, Methyl Red, Congo Red.

Unit 3 Nitrations, nitrating agents, Kinetics and Mechanism of aromatic nitrations process, Equipments for nitration, typical industrial nitrations process e.g. preparation of nitrobenzene, nitro acetanilide.


Unit 6 Principles of Polymer Chemistry, Industrial Practices and applications, Techniques of Polymerization, Types of Polymerization Examples: Addition and Condensation Polymerization, Mechanism of Additional Polymerization. Study of Polymers e.g. PVC, PVA, Conducting Polymer- Polyaniline, Polypyroles, Polythiophenes, .

Books Recommended:
3. Unit Processes in Organic Synthesis- by P. H. Groggins
4. Principles of Polymer Chemistry- by Vasant Gowarikar
5. Chemistry of Organic Natural Products Vol-1 and 2- by O. P. Agrawal
(Second Semester)
APPLIED PHYSICS II (CT (BGE) 2.03)
(Total Credits: 03)

Teaching Scheme                      Examination Scheme
Lectures: 2 Hours/ Week               Theory
Tutorial: 1 Hours / Week              T (U) : 80 Marks    T (I) : 20 Marks

Duration of University Exam. : 03 Hours

UNIT –I  Basic Semiconductor devices  Classification of solids on the basis of band gap
theory into insulators, semiconductors and conductors, Symbol and formation of a diode, P-N
Junction diode: Forward and reverse bias characteristics, Zener diode: Forward and reverse bias
characteristics, Avalanche breakdown Applications: Half wave rectifier & Full wave rectifier,
LED, Photodiode

Intrinsic semiconductors; Extrinsic semiconductor, Germanium and silicon, Transistors: PNP
and NPN. Configuration: - CB, CE and Solar cell.

UNIT – II  Crystal structure and X-Rays  Crystal structures: SC, BCC & FCC, Miller
Indices and Planes, Interplanar distance, Numericals.

Production of X-Rays: Coolidge tube, Origin of X-rays, Properties of X-rays, Applications of X-
Rays, Bragg’s law and Bragg’s X-ray spectrometer.

UNIT – III  Instrumental analysis  Thermal analysis: Differential thermal analysis(DTA),
Thermogravimetric analysis(TGA), Differential Thermogravimetric analysis(DTGA),
Differential scanning calorimetry(DSC), Atomic absorption spectrometry(AAS).

UNIT –V  Ultrasonics  Magnetostriction Effect, Pierce Oscillator, Piezoelectric Effect,
Piezoelectric Oscillator, properties and applications, Numericals.

UNIT – V  Optical Fibres  Optical fibers; structure, Propagation of light through a cladded
fibre, Acceptance angle, acceptance cone, Fractional refractive index change, Numerical
aperture, Modes of propagation; Types of Optical fibres: Single mode step index fibre,
Multimode step index fibre, Graded Index fibre, V-number Attenuation, Dispersion: Material
dispersion, Waveguide dispersion, Intermodal dispersion; Applications: Medical, Military and Communication applications; sensors. Numericals.


Books Recommended

2. Instrumental methods of analysis By H.W.Willard
3. Material Science and Engineering By R.K.Rajput
4. Physics for Engineers By M.R.Srinivasan
(Second Semester)

Basic Electrical Technology (CT (BGE) 2.04)

(Total Credits: 03)

Teaching Scheme

Lectures: 2 Hours/ Week

Tutorial: 1 Hours / Week

Examination Scheme

Theory

T (U) : 80 Marks

T (I) : 20 Marks

Duration of University Exam. : 03 Hours


Unit 2: A.C. Fundamentals, Concept of A C Currents and voltages, Mathematical representations in the form of Vectors and waves, R M S and average values, Form Factors, Phase and Phase difference, Concept of Inductance, Capacitance, Reactance, Impedance, Power and Power Factor.

Unit 3: Transformers – General theory of transformers, Phasor Diagrams, Equivalent Circuits, Open and Short circuit tests, Regulation, Normal and all day Efficiency of transformer

Unit 4: General Principles of electrical Motors and Generators, Synchronous Machines, Construction, E M F and Frequency equations, Behaviour on Load, Synchronous impedance, Open Circuit and Short Circuit tests. Regulation, Principle of rotation, V Characteristics and its applications.

Unit 5: Induction Motors, Principle of rotation and construction of three phase induction motors, Phasor diagrams, operating characteristics, Induction motor starters. Working Principle and application of single phase induction motors

Unit 6: Power generation, working of thermal, hydro and nuclear power stations.
**Books recommended:**

3. Electrical Technology: Cotton (wheeler)
5  
(Second Semester) 
Applied Mechanics (CT (BGE) 2.05)  
(Total Credits: 03) 

Teaching Scheme  
Lectures: 2 Hours/ Week 
Tutorial: 1 Hours / Week 

Examination Scheme  
Theory  
T (U) : 80 Marks  
T (I) : 20 Marks  
Duration of University Exam. : 03 Hours 

UNIT I Basics & Statics of Particles Basic concepts System of Forces, Resolution and composition of forces, system of parallel, concurrent and non concurrent co-planer forces, Resultant. 
Equilibrium Of Rigid Bodies Free body diagram, Types of supports and their reactions, requirements of stable equilibrium, Moments and Couples, Varignon’s theorem, Equilibrium of Rigid bodies in two dimensions. 

UNIT II Centroid and Center of Gravity Centroid of plane and composite figures, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems. 

UNIT III Truss Analysis of simple plane trusses by method of joints and method of sections. 
Friction Types of friction, Limiting friction, Laws of Friction, static and Dynamic Frictions, Motion of Bodies. 

UNIT IV Dynamics of Particles Displacement velocity and Acceleration (rectilinear and rotary), Motion with uniform and variable acceleration and projectiles, D’Alembert’s principle, kinetics of rectilinear translation and rotary motion of rigid body. Dynamic equilibrium in plane motion. 

UNIT V Work, Power and Energy, Conservation of Momentum and Energy. 

UNIT VI Transmission of power by belts Belt Drivers - Open, Crossed and compound belt drives, length of belt, tensions - tight side, slack side, Power transmitted and condition for maximum power, gears and epicyclic gear trains. 

BOOKS RECOMMENDED  
1. Engineering mechanics by Timoshenko and Young.  
3. Engineering mechanics by Beer and Johnson.
6
(Second Semester)
COMMUNICATION SKILLS (CT (BGE) 2.06)
(Total Credits: 02)

Teaching Scheme

Examination Scheme

Practical: 2 Hours / Week

Practical

P ( U ) : 25 Marks

P ( I ) : 25

Marks

Duration of University Exam. : 03

Hours

LIST OF EXPERIMENTS

Following points are to be discussed with the students before conducting the practicals.

A) Principals and Practice of letter writing: Business, Job and Bank Correspondence
B) Technical Report Writing
C) Grammar:
   1. Correction of Common Errors
   2. Exercise on rewrite as directed
   3. Correct use of words, idioms, phrases, prepositions, etc.
D) 1. Principles of Public Speaking
   2. Reading Comprehension
E) 1. Professional Communication Skills (Meaning, Significance, Types, Dimensions & Barriers)

   2. Group Discussion and Personal Interview (Importance of GD, Modules of GD, How to prepare for GD, Meaning, types & techniques of PI, How to prepare for PI)

Books:

1. Public Speaking and Influencing Men in Business- Dale Carnegie
2. Professional Communication Skills-Bhatia and Sheik
4. Communication Skills- Dr.P.Prasad
5. Technical Communication- Raman and Sharma
6. High School Grammar and Composition-Wren and Martin
7. Modern English Grammar Usage an Composition –N.Krishnaswamy
### Communication Skills Laboratory Practical

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Name of the Practical</th>
<th>Activity to be Taken</th>
<th>Medium of Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Barriers to Communication</td>
<td>1. Intro to various kinds of barriers&lt;br&gt;2. Activity class on semantic barriers</td>
<td>PPT Based, Activity Based</td>
</tr>
<tr>
<td>2</td>
<td>Reading Skills</td>
<td>1. Skimming, Scanning &amp; Gist Reading&lt;br&gt;2. Comprehending Passages</td>
<td>PPT Based, Activity Based</td>
</tr>
<tr>
<td>3</td>
<td>Development of Word Power</td>
<td>1. IPA, Pronunciation techniques&lt;br&gt;2. Often wrongly pronounced words&lt;br&gt;3. Word Power, homophones, synonyms/antonyms</td>
<td>Software based&lt;br&gt;PPT Based, Activity Based</td>
</tr>
<tr>
<td>4</td>
<td>Non-Verbal Communication</td>
<td>1. Kinesics in comm./Interviews&lt;br&gt;2. Activities/ role play</td>
<td>Software based&lt;br&gt;PPT Based, Activity Based</td>
</tr>
<tr>
<td>5</td>
<td>Speaking Skills</td>
<td>1. Intro of effective way of speaking&lt;br&gt;2. Oral presentations Extempore/Debate/JAM</td>
<td>PPT Based, Activity Based</td>
</tr>
<tr>
<td>6</td>
<td>Group Discussion</td>
<td>1. GD rules&lt;br&gt;2. GD of groups in 6</td>
<td>Software based&lt;br&gt;PPT Based, Activity Based</td>
</tr>
<tr>
<td>7</td>
<td>Interview Techniques</td>
<td>1. Various types of interviews&lt;br&gt;2. Resume making&lt;br&gt;3. Mock Interviews(one to one)</td>
<td>Software based&lt;br&gt;PPT Based, Activity Based</td>
</tr>
<tr>
<td>8</td>
<td>Use of Figurative Language</td>
<td>1. Intro phrases/idioms/proverb</td>
<td>PPT Based, Activity Based</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------</td>
<td>------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Listening Skills</td>
<td>Listening Barriers</td>
<td>PPT Based, Activity Based</td>
</tr>
<tr>
<td>10</td>
<td>Presentation Skills</td>
<td>1. Preparing visual aids/PPTs</td>
<td>PPT Based, Activity Based</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Writing references</td>
<td></td>
</tr>
</tbody>
</table>
(Second Semester)

Applied Organic Chemistry Practical (CT (BGE) 2.07)
(Total Credits: 02)

Teaching Scheme
Practical: 3 Hours / Week

Marks

Examination Scheme
Practical
P (U) : 25 Marks  P (I) : 25

Duration of University Exam. : 06

LIST OF EXPERIMENTS

1) Separation of Organic Mixtures.

2) Elemental Analysis of C, H, N, Cl, Br, I etc.

3) Functional group detection for example : COOH, CONH₂, Primary Amine, Secondary Amine, Tertiary Amine, Carbohydrate, Phenols, Alcohols, etc.

(Second Semester)
APPLIED PHYSICS PRACTICAL (CT (BGE) 2.08)
(Total Credits: 02)

Teaching Scheme
Practical: 3 Hours / Week

Examination Scheme
Practical
P ( U ) : 25 Marks   P ( I ) : 25 Marks

Duration of University Exam. : 06

List of Experiments

1. To study the characteristics of a pn-junction diode in forward and reverse bias & determine its cut in voltage, static & dynamic resistance.

2. To study the characteristics of a zener diode in forward and reverse bias & determine its breakdown voltage.

3. To determine the Energy gap Eg of semiconductor using PN junction diode in reverse bias mode.


5. To study the input and output characteristics of a transistor in Common base mode & calculate input resistance and current gain α.

6. To study the input and output characteristics of a transistor in Common emitter mode & calculate input resistance and current gain β.

7. To determine the Electrical conductivity by Four Probe method.

8. Study of Optical Fibre kit.

9. To determine the wavelength of sodium light using plane diffraction grating.
9  
(Second Semester)  
Basic Electrical Technology Practical (CT (BGE) 2.09)  
(Total Credits: 02)  

Teaching Scheme

Examination Scheme

Practical: 3 Hours / Week

Practical

P (U): 25 Marks  
P (I): 25 Marks

Duration of University Exam.: 06

List of Experiments

1. Study and verify kirchhoff's laws.
2. Study and verify superposition theorem.
3. To plot B-H curve for magnetic material of single phase transformer.
4. To plot phasor diagram for series RLC circuit.
5. To plot phasor diagram for parallel RLC circuit.
6. To determine the resistance and Inductance of Choke.
7. Find efficiency and regulation for single phase transformer by open and short circuit test.
8. Find efficiency and regulation by direct loading method of single phase transformer.
10. Speed control and reversal of phase of induction motor by voltage variation method.
11. To find regulation of alternator by open circuit and short circuit test.

Textbook for Practical Work:
1. A text Book on Laboratory Course in Electrical Engineering by S.G. Tarnekar & P.K. Kharbanda, M/s. S. Chand & Co., NEW DELHI.
## LIST OF EXPERIMENTS

### NOTE – ONLY FIRST ANGLE METHOD OF PROJECTIONS SHOULD BE USED

**Introduction to Engineering Drawing & Curves used in Engineering Practice:**
Introduction, Use of various drawing instruments, Lettering, Types of lines used in drawing practice, Dimensioning, Types of Scales and representative fraction (R. F.) of scale. Conic sections- Ellipse, Parabola, Hyperbola, Cycloid, Involute & Archimedean Spiral.

**Projections of Points and Lines:**
Basic principles of orthographic projection, reference planes, concepts of four quadrants, methods of orthographic projections: First angle projections and Third angle projections, conventions used to represent methods of orthographic projection. Projections of points in all possible positions w.r.t. reference planes, projections of lines when it is perpendicular to one of the reference planes, when line is inclined to one & parallel to other reference plane, lines inclined to both reference planes. (lines in first quadrant only).

**Projections of Planes:**
Projection of planes when it is parallel to one of the reference planes, when it is perpendicular to one & inclined to other reference plane, when it is inclined to both reference planes.

**Projections of Solids:**
Projections of solids when axis is perpendicular to one of the reference planes, when axis is inclined to one & parallel to other reference plane, when axis is inclined to both the reference planes. (Projections of cube, right regular prisms, right regular pyramids, right circular cylinder, right circular cone, tetrahedron).

**Orthographic Projections:**
Conversion of pictorial view into orthographic views.

**Isometric Projections:**
Definition of Isometric view/projection, Isometric scale to draw Isometric projection, construction of Isometric view from given orthographic views.

**PRACTICAL:**

**Seven Half imperial size drawing sheets as detailed below:**

- Sheet No. 1: Lines, Lettering and Dimensioning
- Sheet No. 2: Curves (Minimum four problems)
- Sheet No. 3: Projection of straight lines (Minimum four problems)
- Sheet No. 4: Projection of Planes (Minimum four problems)
- Sheet No. 5: Projections of solids (Minimum four problems)
- Sheet No. 6: Orthographic Views (To draw three principal views from given isometric View-minimum two problems)
- Sheet No. 7: Isometric Views/Projection (minimum four problems on Isometric views/projections)

**Text Books:**

2. R.K. Dhawan- Engineering Drawing
3. K. Venu Gopal- Engineering Drawing and graphics+ Autocad
5. Pakhatkar- Engg. Drawing , Nirali Prakashan

**Reference Books:**