BTCS 101 (Applied Mathematics – I)

UNIT I

COMPLEX NUMBERS AND INFINITE SERIES: De Moivre's theorem and roots of complex numbers. Euler's theorem, Logarithmic Functions, Circular, Hyperbolic Functions and their Inverses. Convergence and Divergence of Infinite series, Comparison test d'Alembert's ratio test. Higher ratio test, Cauchy's root test. Alternating series, Lebnitz test, Absolute and conditioinal convergence.

UNIT II

CALCULUS OF ONE VARIABLE: Successive differentiation. Leibnitz theorem (without proof) McLaurin's and Taylor's expansion of functions, errors and approximation. Asymptotes of Cartesian curves. Curvature of curves in Cartesian, parametric and polar coordinates, Tracing of curves in Cartesian, parametric and polar coordinates (like conics, astroid, hypocycloid, Folium of Descartes, Cycloid, Circle, Cardiode, Lemniscate of Bernoulli, equiangular spiral). Reduction Formulae for evaluating. Finding area under the curves, Length of the curves, volume and surface of solids of revolution.

UNIT III

LINEAR ALGEBRA – MATTRICES: Rank of matrix, Linear transformations, Hermitian and skeew – Hermitian forms, Inverse of matrix by elementary operations. Consistency of linear simultaneous equations, Diagonalisation of a matrix, Eigen values and eigen vectors. Caley – Hamilton theorem (without proof).

UNIT IV

ORDINARY DIFFERENTIAL EQUATIONS: First order differential equations – exact and reducible to exact form. Linear differential equations of higher order with constant coefficients. Solution of simultaneous differential equations. Variation of parameters, Solution of homogeneous differential equations – Canchy and Legendre forms.

TEXT BOOKS:

1. Ramana, "Higher Engineering mathematics" ,TMH.
2. Kresyzig, E., "Advanced Engineering Mathematics", John Wiley and Sons. (Latest edition).

REFERENCE BOOKS:

1. Mitin, V. V.; Polis, M. P. and Romanov, D. A., "Modern Advanced Mathematics for Engineers", John Wiley and Sons, 2001.
2. "Advanced Engineering Mathematics", Dr. A. B. Mathur, V. P. Jaggi (Khanna publications)
3. Jain, R. K. and Iyengar, S. R. K., "Advanced Engineering Mathematics", Narosa, 2003 (2^{nd} Ed.).
4. "Ramana" Engineering Mathematics. TMH

BTCS 102 (APPLIED PHYSICS – I)

UNIT - I

Interference of Light: Interference due to division of wavefront and division of amplitude, Young's double slit expt., Interference, Principle of Superposition, Theory of Biprism, Interference from parallel thin films, wedge shaped films, Newton rings, Michelson interferometer.

Diffraction: Fresnel Diffraction, Diffraction at a straight edge, Fraunhoffer diffraction due to N slits, Diffraction grating, absent spectra, dispersive power of Grating, resolving power of prism and grating.

UNIT - II

Polarization: Introduction, production of plane polarized light by different methods, Brewster and Malus Laws. Double refraction, Quarter & half wave plate, Nicol prism, specific rotation, Laurent's half shade polarimeter.

UNIT - III

Laser: Introduction, temporal and spatial coherence, principle of Laser, stimulated and spontaneous emission, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Application of Lasers.

Fibre Optics: Introduction, numerical aperture, step index and graded index fibres, attenuation & dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

UNIT - IV

Mechanics: Central and non-central forces, Inverse square force, SHM, Damped, undamped and forced Oscillations.

Special theory of Relativity: Frame of reference, Michelson-Morley experiment, basic postulates of special relativity, Lorentz transformations (space – time coordinates & velocity only), mass energy relation.

TEXT BOOKS:

1. A. Ghatak, "Optics" TMH
2. N. Subrahmanyam and Brij Lal, "Optics"

REFERENCE BOOKS:

1. Jenkins and White, "Fundamentals of Optics"
2. C. Kittle, "Mechanics", Berkeley Physics Course, Vol.- I.
3. A. Beiser, "Concepts of Modern Physics"

BTCS 103 (Applied Chemistry – I)

UNIT - I

Water: Specifications for water, analysis of water – alkalinity, hardness and its determination (EDTA method only). Water for domestic use, Water softening processes – Lime – Soda process, Ion exchange method, boiler feed water, boiler problems-scale, sludge, priming and foaming, caustic embitterment and corrosion, their causes and prevention, removal of silica, removal of dissolved gases, carbonate and phosphate conditioning, colloidal conditioning, calgon treatment, Numerical problems on alkalinity, hardness, Lime-Soda process and Ion exchange method, EDTA method.

UNIT - II

Fuels: Classification, combustion and chemical principles involved in it, calorific value: gross and net calorific values and their determination by bomb calorimeter and Boy's gas calorimeter.

Solid Fuels: Proximate and ultimate analysis of coal and their importance, High and low temperature carbonisation, Coke: Its manufacture by Otto Hoffman oven.

Liquid Fuels: Conversion of coal into liquid fuels (Bergius process and Fisher-Tropsch Process) and mechanism, Petroleum: its chemical composition and fractional distillation, cracking of heavy oil residues – thermal and catalytic cracking, knocking and chemical

structure, octane number and cetane number and their significance, power alcohol, Analysis of flue gases by Orsat's apparatus, Numerical on calorific value, combustion, proximate and ultimate analysis of coal, flue gas analysis.

UNIT - III

Environmental Pollution and Control: Air Pollution: Types of pollutants, source effects, sink and control of primary pollutants – CO, No_x, HC, So_x and particulates, effects of pollutants on man and environment – photochemical smog and acid rain.

Water Pollution: Classification of pollutants, their sources, waste water treatment – domestic and industrial.

Soil Pollution: Composition of soil, classification and effects of soil pollutants and their control.

Solid Waste Pollution: Classification, waste treatment & Disposal methods (Composting, sanitary landfilling, thermal processes, recycling and reuse).

Hazardous Wastes: Classification – radioactive, biomedical and chemical, treatment and disposal – physical, chemical and biological processes.

UNIT - IV

Solutions: Ideal and non-ideal solutions, Raoult's Law, Distillation of binary solutions, Henry's Law, Nernst distribution law, Arrhenius theory and special behaviour of strong electrolytes.

Corrosion: Types of corrosion (dry, wet, atmospheric and soil corrosion), theories of corrosion, protective measures against corrosion.

TEXT BOOKS:

1. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.), By J.C. Kuriacose & J. Rajaram
2. Environmental Chemistry & Pollution Control (Latest ed.), By S.S. Dara
3. Applied Chemistry (Latest ed.), By H.D. Gesser.
4. Engineering Chemistry by Sunita Rattan Katson Books.

BTCS 104 (Manufacturing Processes)

UNIT - I

Casting Processes:

Principles of metal casting: Pattern materials, types and allowance; Study of moulding, sand moulding, tools, moulding materials, classification of moulds, core, elements of gating system, casting defects, description and operation of cupola: special casting processes e.g. die-casting, permanent mould casting, centrifugal casting, investment casting.

UNIT - II

Smithy and Forging:

Basic operation e.g. upsetting, fullering, flattening, drawing, swaging: tools and appliances: drop forging, press forging.

Bench Work and Fitting

Fitting, sawing, chipping, thread cutting (die), tapping; Study of hand tools, Marking and marking tools.

UNIT - III

Metal joining:

Welding principles, classification of welding techniques; Oxyacetylene Gas welding, equipment and field of application, Arc-welding, metal arc, Carbon arc, submerged arc and atomic hydrogen welding, Electric resistance welding: spot, seam, butt, and percussion welding; Flux: composition, properties and function; Electrodes, Types of

joints and edge preparation, Brazing and soldering.

UNIT – IV

Sheet Metal Work:

Common processes, tools and equipments; metals used for sheets, standard specification for sheets, spinning, bending, embossing and coining.

TEXT BOOKS:

1. Manufacturing Process by Raghuvanshi.
2. Manufacturing Technology by P.N.Rao (TMH publications)

REFERENCE BOOK:

1. Workshop Technology by Hazra-Chowdhary
2. Production Engineering by R.K.Jain
3. Workshop Technology by Chapman

BTCS 105 (Introduction to Computers)

UNIT - I

Introduction to Computer:

Overview of Computer organization and historical perspective Computer applications in various fields of science and management.

Data representation: Number systems, character representation codes, Binary, hexadecimal, octal codes and their conversions.

Binary arithmetic, Floating-point arithmetic, signed and unsigned numbers.

UNIT - II

Introduction to OS and Office Automation

Concept of computing, Introduction to Operating Systems such as DOS, windows 2000/Xp, UNIX, Client Server Technology, etc. (only brief user level description).

Introduction to World Processing, Spread Sheet & Presentation software e.g. MS-Word, MS-Excel, MS-Power Point.

UNIT - III

Introduction to Auto CAD

Coordinate System, 2D drafting: lines, circles, arc, polygon, etc., Editing, 3D, Solid modeling, Rendering, Use of Auto CAD for engineering drawing practices.

UNIT - IV

Web Technologies

Introduction to World Wide Web, Search engines, e-mail, news, gopher, Audio & Video Conferencing, Internet Protocols: FTP, telnet, TCP/IP, SMTP, HTTP, Languages used for WEB Technology: HTML, practical examples using DHTML and Static HTML

TEXT BOOKS:

1. Rajaraman, "Fundamentals of Computers", Prentice Hall of India, 3rd Edition.
2. Mark Middlebrook, "Autocad 2004 for Dummies", Pustak Mahel Prakashan, 2000.
3. Vikas Gupta, "Comdex Computer Course Kit", Dreamtech Press, 2004.

REFERENCE BOOKS:

1. Alexis Leon & Mathews Leon, "Fundamentals of Computer Science & Communication Engineering", Leon Techworld, 1998.

2. Omura, "Mastering Autocad 2000 for Mechanical Eng ineers" BPB Publications, 2nd Edition, 1998.
3. A.S. Tanenbaum, " Computer Networks", Pearson Education India Ltd., 3rd Edition, 2002.

BTCS 106 (Communication Skills – I)

UNIT - I

Remedial Grammar: Errors of Accidence and syntax with reference to Parts of Speech; Agreement of Subject and Verb; Tense and Concord; Conditional Clauses; Use of connectives in Complex and Compound sentences; Question tags and short responses.

UNIT - II

Vocabulary and Usage: Word Formations (by adding suffixes and prefixes); Technical Word Formation; Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words; Phrasal Verb Idioms.

UNIT - III

Technical Writing:

(A) Scientific Attitude and Impersonal Style; Plain Statements, Definitions; Description and Explanations (of objects, instruments, Processes, Scientific Principles, etc.)

Summarizing and abstracting; Expressing ideas within a restricted word limit; Paragraph Writing (Paragraph division, introduction and the conclusion, Variety in sentences and paragraphs)

Interpretation and use of charts, graphs and tables in technical writing.

Punctuation

(B) Reading at various speeds (slow, fast, very fast); reading different kinds of texts for different purpose (e.g. for relaxation, for information, for discussion at a later stage, etc.); reading between the lines.

Comprehension of Unseen Passages

UNIT - IV

Text: The following prose pieces from ***Best Science Writing : Reading and Insights*** edited by Robert Gannon prescribed text (Hyderabad: University Press (India) Limited, 1991).

1. Chapter 2: "After 63 years, Why Are They Still Testing Einstein?" by C.P. Gilmore
2. Chapter 5: "Star Wars : The Leaky Shield" By Carl Sagan
3. Chapter 10: "Chaos : The Ultimate Asymmetry" by Arthur Fisher
4. Chapter 11: "Bill Moss, Tentmaker" by Robert Gannon
5. Chapter 12: "Totality - A Report" by Michael Rogers

TEXT BOOKS:

1. Maison, Margaret M. Examine Your English, Hyderabad: Orient Longman, 1980
2. Sharma, R.S. Technical Writing. Delhi: Radha Publication, 1999
3. Sudarsanam, R. Understanding Technical English. Delhi: Sterling Publishers Pvt. Ltd., 1992
4. Gannon, Robert, Edt. Best Science Writing: Readings and Insights. Hyderabad: University Press (India) Limited, 1991.

BTCS 107 (Impact of Science & Technology on Society)

Applied Sciences and Society: Computing Technology, Electronics, Energy, Microtechnology, Nanotechnology, Nuclear technology, Bioinformatics

Information and communication: Multimedia communication, Computer mediated communication (CMC)

Science & Technology in Household: Domestic Appliances, Food Technology, Textiles, Agriculture and Modem technology,

Health and Safety: Health Technology, Biotechnology, Fire protection Technology, Pharmaceuticals, Safety engineering, Sanitary Technology

Industry: Construction, Manufacturing, Machinery, and Mining

Transportation: Aerospace, Motor vehicles, Space technology, Transport

Environment: Air Pollution, Spills on the Seas, Acid Rains, Soil Contamination, Global Warming, and Ozone Depletion.

Weapons of Mass Destruction: Nuclear Bombs, Guns and Ammunition, Biological Warfare, Chemical Warfare

Ethics of Science and Technology

Reference Books:

1. Science in 21st Century (By Dilip M. Salwi

BTCS 108 (Applied Physics LAB – I)

List of Experiments

1. To plot a graph between the distance of the knife-edge from the center of the gravity and the time period of bar pendulum. From the graph, find
2. The acceleration due to gravity
3. The radius of gyration and the moment of inertia of the bar about an axis.
4. To determine the moment of inertia of a flywheel about its own axis of rotation.
5. To determine the value of acceleration due to gravity using koter's pendulum.
6. To determine the frequency of A.C. mains using sonometer and an electromagnet.
7. To determine the frequency of electrically maintained turning fork by Melde's method.
8. To determine the dispersive power of prism using spectrometer and mercury source.
9. To determine the wavelength of sodium light by Newton's Ring.
10. To determine the wavelength of sodium light using diffraction grating.
11. To determine the refractive index of a prism using spectrometer.

12. To determine the specific rotation of cane sugar solution with the help of polarimeter.

13. To find the wavelength of He-Ne Laser using transmission diffraction grating.

14. To determine the numeral aperture (NA) of a Optical Fibre.

15. Compute simulation (simple application of Monte Carlo) e.g. Brownian motion, charging & discharging of capacitor.

16. Measurement of the diameter of a thin wire using the phenomenon of diffraction.

17. To measure the divergence of a laser beam

18. To measure the spring constant K of a spring by
    (a) Static Method
    (b) Dynamic method

Note: Any 8-10 experiments out of the list may be chosen. Proper error – analysis must be carried out with all the experiments.

BTCS 109 (Applied Chemistry LAB – I)

List of Experiments

EXPERIMENT NO. 1

AIM: To determine the percentage composition of a given mixture of NaCl (Sodium Chloride) and NaOH (Sodium hydroxide) 8 gms. Of which is dissolved per litre of the solution.

EXPERIMENT NO. 2

AIM: To determine the amount of $Na_2 CO_3$ (Sodium Carbonate) and $NaHCO_3$ (Sodium bicarbonate) in the given mixture of Na_2CO_3 and $NaHCO_3$.

EXPERIMENT NO. 3

AIM: Determine the amount of Oxalic Acid and Sulphuric Acid in 1 litre of solution given .1 N (standard) NaOH (Sodium Hydroxide) and $KMnO_4$ (Potassium Permanganate) solution

EXPERIMENT NO. 4

AIM: To determine the number of water molecules of crystallization in Mohr's salt provided standard dichromate solution (0.1 N) using diphenylamine as internal indicator.

EXPERIMENT NO. 5

AIM: To determine the strength in g/L of a given $K_2Cr_2O_7$ (Potassium dichromate) solution, provided approximately N/10 sodium thiosulphate and N/10 $K_2Cr_2O_7$.

EXPERIMENT NO. 6

AIM: Determine the strength of Cu in the copper ore solution provided hypo solution (0.1N).

EXPERIMENT NO. 7

AIM: Determine the strength in grams per litre of a given $AgNO_3$ solution being provided N/30 NaCl solution by Mohr's Method.

EXPERIMENT NO. 8

AIM: Determine volumetrically the strength of a given ammonium thiocyanate solution by Bolhard's method, provided N/30 silver nitrate solution.

EXPERIMENT NO. 9

AIM: **(a)** To determine the strength of calcium ions in given $CaCO_3$ solution by Complexometric Titrations.

(b) To determine the strength of Magnesium ions in given $MgSO_4$ Solution by Complexometric Titrations.

EXPERIMENT NO. 10

AIM: Determination of dissolved Oxygen in given sample of water.

TEXT BOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (Latest ed.), Revised by G.H. Jeffery, J. Bassett, J. Mendham & R.C. Denney
2. Applied Chemistry: Theory and Practice (Latest ed.), By O.P. Vermani & A.K. Narula

BTCS 110 (Introduction to AutoCAD, Office Automation and Web Design)

List of Experiments

1. Use Microsoft-Word to perform the following:
   a) Send out invitation letter to several people using mail merge facility.
   b) Create tabular data in word and insert graph to represent data.
   c) Create a Macro and use it in an application.

2. Use Microsoft-Excel to perform the following:
   a) Create a Macro and use it in an application
   b) Enter the name and marks of 10 students and perform various mathematical functions on it.
   c) Enter first quarter performance of five companies and create a pie chart showing their shareholders in the market.

3. Use Microsoft Power Point to perform the following

a) Create a slide show on any subject of your choice using minimum five slides.
b) Create slideshow in operating sound.
c) Create an animation using group, ungroup, order, textbox image insert etc.

4. Use HTML to design a Home page for FMSIT using all the features of HTML like buttons, frames, marquee check boxes etc..

5. Use AutoCAD to do the following:
   a) Use of Drawing & Editing Properties: Modify Object Properties and a know how of layers, colors and prototype drawing.
   b) Draw line (Poly line, multi line, linear line), polygon, ellipse, circle, arc, rectangle and use cross hatching, regions, boundary, spline, donut, fillet and extent commands.
   c) Dimensioning commands, styles, control scale factors, drawing set-up, grip editing objects snaps, utility commands.
   d) Projection of points, lines and solids,
   e) Section of Solids
   f) Development and Intersection of Surface
   g) Isomeric Projections

BTCS 111 (Workshop Practice)

UNIT - I
Materials: Spectrography method for finding composition of materials.
Wood Working Shop: Making of various joints, Pattern making.

UNIT - II
Foundary Shop: Bench moulding with single piece pattern and two piece pattern.
Floor moulding – Making of bend pipe mould etc.
Machine moulding – Making of mould using Match-plate pattern.
Core making- Making and baking of dry sand cores for placing in horizontal, vertical and hanging positions in the mould cavity.

Fitting Shop: Learning use of fitting hand tools, marking tools, marking gauge.
Exercises: Jobs made out of MS Flats, making saw – cut filling V-cut taper at the corners, circular cut, fitting square in square, triangle in square.

UNIT - III
Welding Shop: Electric arc welding, Edge preparations, Exercises making of various joints. Bead formation in horizontal, vertical and overhead positions.
Gas Welding: Oxy-Acetylene welding and cutting of ferrous metals.
Soldering: Dip soldering.
Brazing: With Oxy-Acetylene gas.

UNIT - IV
Sheet Metal Shop: Learning use of sheet-metal tools, Exercises: Making jobs out of GI sheet metal. Cylindrical, Conical and Prismatic shapes.

Project Shop: Extrusion of soft metals, Plastic coating of copper wires, Plastic moulding.

BTCS 111 (Workshop Practice)

Syllabus for Work Shop practice Lab.

A. Welding Shop-

Name of Job/Exercise

1. To study the tools and equipments of electric arc welding.
2. To make a Butt joint by electric arc welding.
3. To make a lap joint by electric arc welding.
4. To make a T-joint by electric arc welding.
5. To study the tools and equipments of gas welding.
6. To make a butt joint by gas welding.
7. To make a lap joint by gas welding.
8. To make a T-joint by gas welding.

B. Carpentry Shop-

Name of Job/Exercise

1. To study carpentry tools.
2. To make a cross-lap joint.
3. To make a T-lap joint.
4. To make a mortise and tenon joint.

C. Sheet Metal Shop-

Name of Job/Exercise

1. To study the tools and equipments used in sheet metal shop.
2. To make and practice the sheet metal joints as lap seam joint, single seam joint, Double seam joints, cap joint and angular joint.
3. To make a dustbin.
4. To make a funnel.
5. To make a cylindrical mug with rectangular handle.

D. Fitting Shop-

Name of Job/Exercise

1. To study the fitting tools.
2. To practice cutting by hand hacksaw and power hacksaw m/c.
3. To practice marking, of a given piece of 50×70 mm.size.
4. To practice filing to make edges, surfaces straight, plane and at right angle to their adjacent edge & surface.
5. To fit a square piece of 15 mm×15mm. Dimension into a square piece of 50×50mm.dimensions.

BTCS 112 (Engineering Graphics Lab)

UNIT - I

General: Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic Projection, B.I.S. Specifications,

Projections of Point and Lines: Introduction of planes of projection, Reference and auxiliary planes, projections of points and Lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on Auxiliary planes, shortest distance, intersecting and non-intersecting lines.

UNIT - II

Planes other than the Reference Planes: Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., Projections of points and lines lying in the planes, conversion of oblique plane into auxiliary Plane and solution of related problems.

Projections of Plane Figures: Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one of both reference planes). Obtaining true shape of the plane figure by projection.

UNIT - III

Projection of Solids: Simple cases when solid is placed in different positions, Axis faces and lines lying in the faces of the solid making given angles.

CADD

UNIT - IV

Isometric Projection

Monography: Basic Concepts and use.

TEXT BOOKS:

1. Engineering drawing by N.D.Bhatt (Charotar Publications).

REFERENCE BOOKS:

1. Engineering Drawing by S.C.Sharma & Navin Kumar (Galgotia Publications)
2. Engineering Drawing by Venugopalan.
3. Engineering Drawing by P.S.Gill