COURSE STRUCTURE & SYLLABUS OF
BACHELOR OF TECHNOLOGY (B.TECH)

Course Structure

First Year

First Semester

Paper Code	Subject
BF1	Mathematics – I
BF2	Chemistry
BF3	English for Communication
BF4	Electrical Technology
BF5	Mechanics
BF6	Introduction to Manufacturing Process

SYLLABUS

BF1 : MATHEMATICS I

1 : LIMITS AND CONTINUITY OF A FUNCTION.

2 : DIFFERENTIATION.
Definition, Derivative by first principle, Differentiation of implicit functions, Differentiation of trigonometric functions, Differentiation of inverse trigonometric functions, Transformation, Differentiation of exponential and Logarithmic Functions, Hyperbolic functions, Derivatives of the inverse hyperbolic functions, Differentiation with respect to a function, Differentiation of Parametric Equations.

3 : SUCCESSIVE DIFFERENTIATION
Calculation of nth derivative, Leibnitz's theorem.

4 : GENERAL THEOREMS, EXPANSION OF FUNCTIONS.
Rolle's Theorem, Mean value theorem (Lagrange's form), Increasing and Decreasing functions, Mean value theorem (Cauchy's form).
Expansion of functions;
Taylor's expansion theorem, Maclaurin's theorem, Taylor's and Maclaurin's infinite series.

5 : INDETERMINATE FORM

L' Hospital's rule, Evaluation of % form, Evaluation of $\frac{\infty}{\infty}$ form, Evaluation of $\infty - \infty$ form, Evaluation of 0^0, 1^{∞}, ∞^0 form.

6 : CURVATURE
Radius of curvature, Special formula for parametric equations, Radius of curvature at the origin.

7 : MAXIMA AND MINIMA
Maximum and Minimum values of a function.

8 : ELEMENTARY INTEGRATION
Table of elementary integrals, Simple examples.

9 : INTEGRATION BY SUBSTITUTION

Introduction, Change of independent variable in $\int f(x)dxy$, Working rule to evaluate $\int f(x)dx$ by the substitution, Four important integrals, standard forms, Integrals of tan x, cot x, sec x, cosec x.

10 : INTEGRATION BY PARTS

$\int u.vdx$, $\int e^x[+(x)+f'(x)]dx$, Important integrals.

11 : INTEGRATION BY PARTIAL FRACTIONS

Non-repeated linear factor, Repeated linear factor, Linear and quadratic factors (non-repeated) Quadratic (repeated), Integration of rational fraction by substitution.

12 : INTEGRATION OF IRRATIONAL ALGEBRAIC FUNCTIONS

Integration of rational functions, integral of the type $\int \frac{dx}{x\sqrt{y}}$

13 : INTEGRATION OF TRIGNOMETRIC FUNCTIONS

$\int \sin^m x \cos^n x dx$, Reduction formula method, Integration of positive even integral, Integrals of rational functions of sinx and cosx.

14 : REDUCTION FORMULA

$\int \sin^n x$, $\int_o^{\Pi/2} \sin^n x dx$, $\int \sin^p x \cos^q x$, $\int_o^{\Pi/2} \sin^p x \cos^q x dx$, $\int \tan^n x dx$, $\int \sec^n x dx$, $\int \cos ec^n x dx$, $\int \cot^n x dx$.

15 : DEFINITE INTEGRALS

Definition, Properties of definite integrals, Examples base on properties.

16 : AREAS OF PLANE CURVES

17 : VOLUMES AND SURFACES OF SOLIDS OF REVOLUTION

18 : LENGTHS OF PLANE CURVES

Arc Formulae, Arc formulae for polar equations.

19 : SIMPSON'S RULE

<u>BF2 : CHEMISTRY</u>

1. WATER TREATMENT:

Introduction, Sources of Water, effect of Water on Rocks and Minerals, Types of Impurities Present in water, Effects of Impurities in Natural Waters, Methods of Treatment of Water for Domestic and International Purposes, Removal of Dissolved Salts: Softening of Water, Boiler Feed Waters, Boiler Troubles.

2. FUELS

Introduction, Classification of Fuels, Solid Fuel (Coal), Classification of Coal by Rank, Analysis of Coal, Pulverized Coal, Metallurgical Coke, Manufacture of Metallurgical Coke, Liquid Fuels, Petroleum, Refining of Petroleum, Synthetic Petrol, cracking, Polymerisation, Synthetic Method, Refining Gasoline, Reforming, knocking, Gaseous Fuels, Natural gas, Producer Gas, Water Gas or Blue Gas, Bio-gas, Fuel gas.

3. LUBRICANTS

Introduction, Functions of Lubricant, Requirements of a Lubricant, Mechanism of Lubrication, Classification of

Lubricants, Properties of Lubricating oils, Glossary, Questions.

4. POLYMERS AND PLASTICS

Introduction, Polymerisation, Classification of Polymers, Tacticity, Functionality of Polymer, Polymerisation Processess, Mechanism of Addition Polymerisation, Effects of Structure on Polymer Properties, Plastics, Compounding of Plastics, Thermoplastics resins, Silicones resins, Elastomers or rubber, Adhesives, Glossary, Questions.

5. THERMODYNAMICS

Introduction, Laws of Thermodynamics, Isothermal and adiabatic Processes, Thermochemistry, System, Glossary, Questions.

6. CORROSION

Introduction, Characteristics of Corrosion, Mechanism of Corrosion of iron, Types of Corrosion, Corrosion and redox Process, Factors Which influence Corrosion, Corrosion Control, Glossary, Questions.

7. ENVIRONMENTAL POLLUTION CHEMISTRY

Introduction, Important definitions, Air Pollution, Water Pollution, Soil Pollution, Pollution by heavy metals, Glossary, Questions.

8. METALLIC BOND AND SEMICONDUCTORS

Introduction, Nature of Metallic bond: Theories, Mechanism of thermal Conduction**,** Mechanism of electrical conduction, Ductility and malleability, Thermal conductivity, Electrical Conductivity, Photoconductors, Semiconductors, Glossary, Questions.

BF3 : ENGLISH FOR COMMUNICATION

1. THE COMMUNICATION EVENTS

Nature Of Communication, Objective, Definition Of Communication, Situation For Communication, Need Of Communication, Types Of Communication, Verbal Or Oral Communication, Elements Of Communication , Modes Of Communication (Verbal And Non-Verbal), Charts And Graphs, Flow Process Chart, Written Communication , Oral Communication, Media: Channels Of Communication, Message : Form And Content, Communication Process, Effective Communication, Barriers Of Communication, Summary

2. SUMMARIZATION

Summary Writing

3. COMPREHENSION AND VOCABULARY

Comprehension, Vocabulary [(A) Synonyms And Antonyms, (B) Homonyms, (C) Same Word Used As Different Parts Of Speech, (D)One Word Substitution], Word Formation, Root

4. PRINCIPLE OF LANGUAGE GRAMMAR AND USAGES

The Sentence Elements, Words, Phrases, Clauses Sentences, Sentence, The Word, Noun, Verb, Tenses And Their Usages, The Verb : Person And Number, Agreement Of The Verb With The Subject, The Infinite, Adverbs, Adjectives, Preposition, Relations Expressed By Prepositions, Conjunction, Clauses, Determiners And Modifiers, Sentence Connectives, The Compound Nd Complex Verb Phrase, Complementation And Subordination, Sentences, Change Of Voice, Change Of Degree, Affirmative And Negative Sentences, Direct And Indirect Speech, Conversion Of Compound Sentences Into Simple Sentences, Conversion Of Complex Sentences Into Compound Sentences, Punctuation

5. BASIC OFFICIAL CORRESPONDENCE

The Process Of Formal Written Communication, The Qualities Of Good Writing, Principles Of Message Organization, Mechanics Of Writing, Elements Of Structure, Forms Of Layout, Styles Of Presentation, Types Of Letters ,Enquiry Letter, Making Claims, Offering Adjustments, Communication Core, Importance And Function, Drafting The Application, Elements Of Structure, Preparing The Resume, Job Offer, Resignation Letter, Communication Core

6. TECHNICAL WRITING

Framing Definitions, Classification And Description Of Objects, Instructions, Types Of Instructions

BF4 : ELECTRICAL TECHNOLOGY

1. BASIC CONCEPTS & UNITS:

Force, Weight, torque, work, energy, Power, Electric charge, Electric Current, EMF, Voltage, Potential Difference Concepts of Ac/Dc Voltage/current.

2. ELECTROSTATICS:

Coulomb's Law, Electric Field, Electric Flux, Electric Field Intensity, Electric Flux Density, Electric Displacement, Charge Density, Permittivity, Dielectric Constant, Electric Potential, Gauss Law, Capacitor, Capacitance of parallel Plate Capacitor, Energy Stored in Capacitor, Capacitors in Series & Parallel, Capacitance of a Multiplate Capacitor, Force of Attraction between plated of Capacitor, Insulation Resistance of Cable.

3. ELECTRIC CIRCUIT ELEMENTS:

Resistance, Specific Resistance, Resistance in Series & Parallel, Open Circuit and Short Circuit, Temperature Coefficient of Resistance, Linear & Non-linear Resistance, Inductance, Energy Stored in Inductance, Inductance in Terms of Flux Linkage Per Ampere, Inductance in Series & Parallel, Linear & Non-linear Inductances.

4. ELECTROLYSIS & STORAGE CELL:

Electrolysis, Faraday's law of Electrolysis, Primary & Secondary Cells, Equivalent Circuit of Cell, Rating of Cell, Cells in Series & parallel, Lead Acid Battery, Nickel Cadmium Cell, Zinc Carbon Cell.

5. ELECTROMAGNETISM:

Magnetic Field, Electromagnetism, Magnetic & Non-Magnetic Materials, Permanent & Temporary magnets, Magnetic flux Density, MMF, Magnetic Field Strength, Force on a Conductor Carrying Current in a Magnetic Field, Biot Savart Law, Ampere's law, Permeability, Force between parallel Conductors, Definition of Ampere, magnetic Shielding, B-H Curve, Magnetisation Curve, Hysteresis, Hysteresis Loss, Modern Theory of Magnetism, Electromagnetic Induction, Fleming Right Hand Rule, Lenz's law, Dynamically Induced e.m.f., Statically induced e.m.f., Eddy Currents, Eddy current loss, Self & Mutual Inductance, Coefficient of Coupling.

6. SINGLE PHASE AC CIRCUITS:

Alternating Voltage & Current, Phase Angle, Phase Difference, Average Value of Sinusoid, Root mean Square or Effective Value, Representation of Sine Wave by Phasor, Alternating Current and Power in Resistive Circuit, Alternating Current and power in Capacitive Circuit, Alternating Current in Series RL Circuit, Apparent, Active & Reactive Power & Power Factor,
Alternating Current & Power in RC Circuit, Alternating Current & Power in RLC Series Circuit.

BF5 : MECHANICS

1 INTRODUCTION

Introduction to Mechanics, Definitions, Idealisation in Mechanics, Basic Concepts, Fundamentals Principles, System of Units, Dimensional Analysis, Methods of Solution, Vector Algebra, Summary.

2 STATICS OF PARTICLES CONCURRENT FORCES IN PLANE

Introduction, Resultant of Forces, Resolution and Components of Force, Resultant of Several Concurrent Forces, Equilibrium of a Partical, Equation of Equilibrium, Application of Statics of Particles, Summary.

3 STATICS OF PARTICLES CONCURRENT FORCES IN SPACE

Introduction, Components of Forces in Space, Resultant of Several Concurrent Forces, Equilibrium of a Particle in Space, Application of Statics of Particle, Summary.

4 STATICS OF RIGID BODIES___ NON – CONCURRENT FORCES IN PLANE

Introduction, Moment of Force about a Point, Varignon's Theorem, Moment of Couple, Resolution of a Given Force into a Force, Resultant of Coplanar Non-Concurrent System, Application of Statics of Rigid Bodies, Method of Minimum Potential Energy- Stable Equilibrium, Summary.

5 STATICS OF RIGID BODIES-NON-CONCURRENT FORCES IN SPACE

Introduction, Moment of Force about a Point, Moment of Force about a Given Axis, Couples in Space, Resolution of Force into Force and Couple, Resultant of Non-concurrent, Non-coplanar System, Equilibrium of Rigid Body in Three Dimensions, Summary.

6 FRICTION

Introduction, Characteristics of Dry Friction, Laws of Friction, Angle of Friction, Angle of Repose, Cone of Friction, Applications, Summary.

7 CENTROID AND CENTRE OF GRAVITY

Introduction, Centroid of Area, Line and Volume, Centroid of a Line, Centroid of Area, Centroid of Composite Area, Therorems of Pappus and Guldinus, Centroid of Volume, Centre of Gravity, Centre of Mass, Summary.

8 MOMENT OF INTERIA AND MASS MOMENT OF INTERIA

Introduction, Second Moment of Area, Moment of Inertia of Plane Area by Integration, Moment of Inertia of Composite Section, Principle Axes and Principle Moments of Inertia of a Thin Rectangular Plate, Mass Moment of Inertia, Summary.

9 SIMPLE STRESSES AND STRAINS SSS-1

General Meaning of Stress , Unit of Stress, Simple Stresses, Strain, Stress Strain Relation, Nominal Stress and True Stress, Behaviour of Materials Under Repeated Loadings, Factor of Safety, Hooke's Law, Extension/Shortening of a bar, Bars With Cross-Sections Varying in Steps, Bars With Continuously Varying Cross-Sections, Bars Subjected to Varying Loads, Indeterminate Structural Problems, Compounds Bars, Temperature Stresses, Simple Shear, Poisson's Ratio, Volumetric Strain, Elastic constant, Relationship between Modulus of Elasticity and Modulus of Rigidity, Relationship between Modulus of Elasticity and Bulk Modulus, Strain Energy due to Direct Stresses and Impact Loads, Strain Energy due to Share Stresses.

10 SHEAR FORCE AND BENDING MOMENT DIAGRAMS IN STATICALLY DETERMINATE BEAMS SFB-1

Shear Force and Bending Moment, Sign Convention, Relationship between Load Intensity, Shear Force and Bending Moment Diagrams, SF and BMD For Standard Cases, FD and BMD for Beams Subjected to Various Loads, Short Cut Procedure.

BF6 : INTRODUCTION TO MANUFACTURING PROCESSES

UNIT I :

1. MILLING MACHINES

Introduction; classification and types; Size and specifications; Accessories attachment; Milling cutters; Classification and types of milling cutter.; Nomenclature of cutter; Setup-operation ; Method of feeding work piece;

Operation on milling machine; Indexing (simple compound, differential angular) ; Helical milling cam milling ; Cutting speed & ledge ; Machining time calculation; Milling operation compound with other operations

2. THE LATHE

Introduction, Functions, Types, Descriptions & Functions of Lathe Parts, Lathe Accessories & attachments, lathe Operations.

3. GRINDING MACHINE

Introduction.; Types of Grading machines (Floor stand, Precision. Plain, cylindrical, universal centrals Internal, surface disc); Special grinding machine, (Tool and cutter grinder, cam and and shape grinders); Shape of grinding wheel; Grinding wheel designation as per- IS -551 -19-54; Grinding wheels ; Grinding wheel elements (abrasives - its types, Grain sizes, Grade, structure, bonding material etc.); Diamond wheel; Grinding wheel section; Allowances for grinding wheel; Mounting of Grinding wheel; Dressing and cursing, of grinding wheel

4. BORING, BROACHING AND SAWING MACHINE

Introduction to Boring machines ; Types of Boring machine ; Boring haps and heads; Various operations using boring heads; Boring operations using end supports; Introduction to Broaching machine ; Types of Broaching machine; Broaching tool nomenclature; Types of Broaches; Broaching options compared with other process (advantages & limitations.); External; Lubrication and cooling; Application of Broaching

5. GEAR MANUFACTURING

Gear tooth e1ement; Materials for Gears; Different methods of Gear manufacturing ; Gear generating methods; Gear milling ; Gear shaping (Working principal of machine tool required Gear shaping cutters etc.) ; Gear Hibbing (Working principal of machine tool required Gear hobbing operation) ; Gear finishing process (Gear sharing burnishing, grinding honing lapping

6. METAL FINISHING PROCESS

Introduction; Honing; Description and construction of honing tool.; Application of honing process; Lopping; Description of Lapping compound and tool; Application of Lapping ; Super finishing process Burnishing - Polishing - Buffing ; Application of super finishing operations.

7. PATTERN MAKING

Introduction, Pattern Materials, Pattern Making Tools, Pattern Allowances, Types of Patterns, Solid or Single Piece Pattern, Split Pattern, Match Plate Pattern, Cope and Drag Pattern, Loose Piece Pattern, Gated Pattern, Sweep Pattern, Skeleton Pattern, Shell Pattern, Segmental Pattern, Follow Board Pattern, Lagged-up Pattern, Left and Right hand Pattern, Core Boxes, Colour coding for Pattern and Core Boxes.

8. MOULDING AND CORE MAKING

Introduction, Moulding Materials, Moulding Sand, Sand Binders, Sand Additives, Properties of Moulding Sand, Classification of Moulding Sand, Grain Shape and Size of Sand, Preparation of Moulding Sand, Types of Moulding Sand, Moulding Processes, Types of Moulds, Methods of Moulding, Methods of Green Sand Mould by Turn Over Method, Gates and Risers, Types of Gates, Moulding Methods with Typical Patterns, Cores, Types of Cores, Core Binders, Core Making, Core Setting, Core Shifting and Chaplets.

9. CASTING PROCESSES

Introduction, Permanent Mould Casting, Semi-permanent Mould Casting, Slush Casting, Die Casting, Centrifugal Casting, Investment Casting, Shell Moulding Process, Continuous Casting, Defects in Casting, Cleaning of Castings, Inspection of Castings, Design of Castings.

10. WELDING

Introduction, Weldability, Advantages and Disadvantages of Welded Joints, Types of Welded Joints, Cold Pressure Welding, Types of Welded Joints, Fillet Welded Joints, Edge Preparation and Applications, Welding Positions, Black Smith's Forge Welding, Electric Resistance Welding, Types of Electric Resistance Welding, Spot Welding,

Roll Spot and Seam Welding, Projection Welding, Butt Welding, Percussion Welding, Arc Welding, Polarity in Arc Welding, Comparison Between A.C. and D.C. Arc Welding, Types of Arc Welding, Electrodes for Arc Welding, Arc Welding Equipment, Precautions in Arc Welding, Arc Welding Processes, Carbon Arc Welding, Metal Arc Welding, Metallic Inert-gas (MIG)Arc Welding, Tungsten Inert-gas (TIG)Arc Welding, Atomic Hydrogen Welding, Stud Welding, Submerged Arc Welding, Plasma Arc Welding, Flux Cored Arc Welding, Electro-slag Welding, Electro-gas Welding, Thermit Welding, Solid State Welding, Modern Welding Processes, Basic Weld Symbols, Supplementary Weld Symbols, Elements of a Welding Symbol, Standard Location of Elements of a Welding Symbol, Gas Welding, Equipment for Oxy-acetylene Gas Welding, Welding Rods, Fluxes, Gas Flame, Gas Welding Technique, Gas or Oxygen Cutting of Metals, Cutting Machines, Oxygen Lance Cutting, Arc Cutting, Oxygen Arc Cutting Process, Welding of Various Metals, Testing of Welded Joints, Braze Welding, Soldering, Brazing.

11. RECENT DEVELOPMENT IN MANUFACTURING PROCESS

Introduction, Working of NC Machines tools, Classification of NC Machines, Programming for NC Machines, Methods of Listing the Co-ordinates of points in NC System, Application of NC Machine, Advantages & Disadvantages, Computer Numerical Control & Direct Numerical Control.

UNIT 2 : (ONLY FOR BF6 STUDENTS)

12. FOUNDRY TOOLS AND EQUIPMENTS

Introduction, Foundry Tools and Equipments, Foundry Hand Tools, Moulding Boxes (Flasks), Moulding Machines, Melting Equipment, Pouring Equipment.

13. HOT AND COLD WORKING PROCESS

Introduction, Objectives, Hot Working Process, Hot Rolling, Types of Rolling Mills, Hot Forging, Hot Spinning, Hot Extrusion, Hot Drawing or Cupping, Hot Piercing, Cold working process, Cold Rolling, Cold Forging, Cold Spinning, Cold Extrusion, Cold Drawing, Cold Bending, Shot Peening.

14. POWDER METALLURGY

Introduction, Objectives, Characteristics of Metal Powders, Preparation of Metal Powders, Process used for Manufacturing parts from Metal Powders, Primary Processes, Secondary Processes, Advantages of Powder Metallurgy, Limitations of Powder Metallurgy, Design Considerations for Powder Metallurgy, Typical Applications of Powder Metallurgy.

15. PLASTIC MANUFACTURING PROCESS

Introduction, Objectives, Types of Plastics - Thermosetting Resins & Thermoplastic Resins, Synthetic Rubber or Elastomers, Moulding Compounds, Fabrication of Plastics, Machining of Plastics, Joining of Plastics.

UNIT 3 : (ONLY FOR BSM5 STUDENTS)

1. Metal Cutting and Cutting Tools

2. Drilling Machines

3. Shaper, Planner and Slotting Machine

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