SWAMI VIVEKANAND UNIVERSITY, SIRONJA, SAGAR (M.P.)

SYLLABUS

For

Department of Civil Engineering

Bachelor of Technology (Cement technology)

Course Code: BTCT

Faculty of Engineering

Duration of Course: 4Year

Examination Mode: Semester

Examination System: Grading

Swami Vivekanand University, Sironja Sagar (M.P.)

2014-2015

Swami Vivekanand University, Sagar(M.P.)

Semester-I

Communication Skills (BTCT-0101)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTCT-0101	Communication Skills	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I — Marks :16

COMMUNICATION PROCESS AND ITS NEEDS

How to make communication effective, Barriers in communication, Removal of barriers. Grammar and vocabulary for correct English usage. Determiners, Prepositions, Auxiliary verbs and subject- Verb agreement, Rewrite as directed (change voice, correct form of verbs/ tenses), Vocabulary – Oneword substitution, words often misused and wrongly spelt.

UNIT – II — Marks :16

PASSAGES OF COMPREHENSION

Prescribed passages (six from existing syllabus), Language of Science, Desalination or Desalting Process, Safety Practices, Non-conventional Sources of Energy, Our Environment, Entrepreneurship, Writing summary, moral and characterization of any one story from the book prescribed.

UNIT – III — Marks :16

BUSINESS COMMUNICATION

Principles of effective business correspondence Its parts, mechanics, styles and forms., Application for job, Bio-Data and C.V., Letter of Enquiry, Placing order, Complaint

UNIT – IV — Marks :16

COMPOSITION & TRANSLATION

Writing paragraphs of 150 words on topics of general interest i.e. pollution, ragging college, importance of computers, importance of communication skill, importance of science and technology etc., Translation (Hindi to English and vice- versa).

UNIT – V — Marks :16

UNSEEN PASSAGES & PRECIS WRITING

Answer the questions based on the passage. Give suitable title, Writing Précis.

Reference Books

1. English Conversation Practice, Grant Taylor.
2. Practical English Grammar, - Thomson & Martinet.
3. Communication Skills for Technical Students Book– I, Book – II, M/S Somaiya Publication, Bombay.
4. Living English Structure, S. Allen.
5. English Grammar, Usage, and Composition, Tickoo & Subramanian, S. Chand & Co. Standard Allen Longman.
6. Essentials of Business Communication, Dr. Rajendra Pal & J.S. Korlahalli S.Chand & Sons, New Delhi.
7. Effective Business Communication, M.V. Rodriques, Concept Pub. Co. New Delhi.
8. Communication for Business, Shirely Taylor, Longman, England.
9. Communication for Engineers and Professors, P. Prasad, S.K.Kataria and sons publications, New Delhi.
10. Technical English Book-II, Somaya Publications, New Delhi.

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Physics (BTCT-0102)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min		(d) =	Max	Min		(h) =	(i) =	
						(a)	(b)	(c)	(a+c)	(e)	(f)	(g)	(e+f)	(d+h)	
BTCT-0102	Physics	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I **Marks :16**

UNITS & MEASUREMENT: Fundamental and derived units, Scalar and vector, Basic requirements to represent vector, Symbols, abbreviation, and proculation, Linear measurement by vernier calipers, screw gauge and spherometer Angular measurement by angular vernier, MOTION: Motion and its type, Linear motion (laws and equation), Circular motion, Angular velocity and relation with linear velocity, Centripetal acceleration, Centripetal and Centrifugal forces Rotatory motion, Axis of rotation, Moment of Inertia, Radius of gyration, Kinetic energy of rotation, Numerical Problems and solution on the topic.

UNIT – II **Marks :16**

MOLECULAR PHENOMENON OF SOLIDS, LIQUIDS AND GASES: Postulates Of Molecular Kinetic Theory of Structure of Matter, Brownian motion, Kinetic and Potential energy of molecules, Kinetic theory of gases, Postulates, Calculation of pressure by Kinetic theory, Prove of different gases law by Kinetic theory. **PROPERTIES OF MATTER**: Elasticity: Meaning, definition, stress, stain, Hook's law and elastic limit, Surface Tension : Meaning, definition, molecular forces, cohesive and adhesive forces, surface energy, capillary rise and capillary rise method.Viscosity : Meaning, definition, stream line and turbulent flow, critical velocity, Stock's law. Numerical problems and solution on the topic.

UNIT – III **Marks :16**

HEAT: Heat and temperature, concept of heat as molecular motion, Transmission of heat, study state and variable state. Concept of heat capacity, specific heat and latent heat. Calorimeter and its uses, Thermodynamics , Relation between heat and work, Mechanical equivalent of heat, First law of thermodynamics and its application, Second law of thermodynamics and its application. Carnot cycle, Numerical problems and solution on the topic. Heating effect of current and thermoelectricity: Heating effect of electric current: Joule's law, work energy and power in electric circuit, calculation of electric energy. Thermo electricity, See back effect and thermoelectric power. Neutral temperature, emperature of inversion and relation between them, Thermo electric thermometer and thermo couples. Numerical problems and solution on the topic.

UNIT – IV **Marks :16**

SOUND: Production of sound waves(Longitudinal and transverse waves), Progressive and stationary waves, Basic knowledge of refraction , reflection, interference and diffraction. Ultrasonic, Audible range, Production of ultrasonic, properties and uses, **OPTICS AND OPTICAL INSTRUMENTS**: Refraction, critical angle and total internal reflection, refraction, through lenses and problems, Power of lenses, Spherical and chromatic aberrations, Simple and compound microscope, telescope and derivation for their magnifying power, Numerical problems and solution on the topic.

UNIT – V **Marks :16**

ELECTROSTATICS AND ELECTROMAGNETIC INDUCTION: Coulomb's law, Electric field intensity, potential. Capacity, principle of capacitor, types of capacitor, combination of capacitors, Electromagnetic Induction: Faraday's law, Lenz's law, Self and mutual inductance, Transformer and electric motor, Induction coil. **MODERN PHYSICS, BASIC**

ELECTRONICS: Photoelectric effect, threshold frequency, Einstein- equation, Photo electric cells, Radioactivity : decay constant, Half life, mean life, Properties of nucleus, nuclear mass, mass defect, Production of x-rays, properties and its uses, Thermal emission, semiconductors, Types of semiconductors, Explanation of conductor, semiconductor and insulators on the basis of band theory, P-N junction, diode as rectifier.

Reference Books

1. Applied Physics Vol. 1 & 2, Saxena and Prabhakar.
2. Physics, - Ttti Publication.
3. Physics Vol. 1 &2, Halliday and Resnic R.
4. Engineering Physics, - Gaur and Gupta.
5. Principle of Physics, Brij Lal & Subramanyan.
6. Physics for Technical Education, LS Zednov.

List of Experiments

1. Refractive index of prism (I-d) curve
2. Refractive index of prism (spectrometer)
3. Focal length of a convex lens by u-v method
4. Focal length of a convex lens by displacement method
5. Verification of Ohm's law
6. To find out unknown resistance by meter bridge
7. To find out internal radius of hollow tube by vernier calipers.
8. To find out volume of given cylinder by screw gauge.
9. Surface tension by Capillary rise method.
10. Coefficient of viscosity
11. Coefficient of Thermal conductivity by searl's method.
12. Verification of Newton's cooling law.

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Chemistry (BTCT-0103)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min		(d) =	Max	Min		(h) =	(i) =	
						(a)	(b)	(c)	(a+c)	(e)	(f)	(g)	(e+f)	(d+h)	
BTCT-0103	Chemistry	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I **Marks :16**

ATOMIC STRUCTURE AND RADIOACTIVITY : Discovery of electron, proton ,neutron and nucleus. Ruther ford's and Bohr's model of anatom. Bohr Burry scheme of filling the electrons in various orbits. Idea of s,p,d,f orbital.Alfa, Gamma and Beta rays, theory of radio activity, Group displacement law, half life period, numerical problems on half life period, fission and fusion.

SURFACE CHEMISTRY AND ITS APPLICATION: True solution, colloidal solution and suspension, lyophobic and lyophillic colloids, optical and electrical properties of colloids, coagulation, coagulants, idea about gels and emulsions.

ELECTROCHEMISTRY: Electrolysis, Faraday's laws of electrolysis, Numerical problems on Faradays Law, electroplating of copper and nickel.

COLLIGATIVE PRPOPERTIES: Osmosis & osmatic pressure, Relative vapour pressure and Routls law. Internal energy (enthalpy) Entrophy, Entrophy fusion free energy, Effect of change in temperature catalysis.

UNIT – II **Marks :16**

CHEMICAL BONDING AND CATALYSIS: Bonding: Nature of bonds- Electrovalent, Co-valent, co-ordinate and hydrogen bond. Catalysis : Types , theory characteristic, positive , negative, auto and induced catalyst. Catalytic Promoter, and catalytic inhibitors. Industrial Application of catalysis.

WATER: Sources of water, types of water, hardness of water, its causes, types and removal, Boiler feed water, harmful - effects of hard water in boiler. Municipal water supply. Numerical on soda lime process. Determination of hardness of water by O. Hener's, EDTA and soap solution method.

UNIT – III **Marks :16**

METALS AND ALLOYS : Physical and chemical properties of metals, copper, iron, aluminum, tin, nickel. General principal of metallurgy, minerals/ ores, ore dressing, roasting ,smelting, bassemerisation, fluxes, purification . Explanation of alloying purposes, methods of alloying, composition and uses of alloy like brass, bronze, duralium, German silver, gun metal, solder, stainless steel, casting and bearing alloy. Ionization, Ph value corrosion and protection: Arhenius theory of ionization, factors affecting ionization. pH meaning (numerical), Buffer solutions and Buffer actions, choice of indication (acidimetry and alkalimetry). Explanation of corrosion, types of corrosion, factors effecting corrosion, corrosion control (protection against corrosion), metal and organic coating for corrosion control.

UNIT – IV **Marks :16**

GLASS, CEMENT AND REFRACTORY: Glass: Basic raw materials for glass, composition and manufacture of glass, varieties of glass and annealing of glass, Cement : Constituting compounds in cement, Composition of Portland Cement, its manufacture, setting and hardening of cement. Refractories : Meaning, characteristics , use of common refractory materials.

HIGH POLYMERS, RUBBER AND INSULATORS: Polymerization and condensation, classification of plastics, Compounding and Moulding constituents of plastics. Preparation Properties and uses of PVC, polyethene, polystyrene, polyamides, polyesters , Bakelite. Synthetic

fibers - nylon, rayon, decron, and polyesters. Definition characteristics , classification and properties of insulators. Glass, wool and thermocole. Idea about rubber and vulcanization .

UNIT – V **Marks :16**

LUBRICANTS, PAINTS AND VARNISHES: Lubricants: Meaning , type and theory of lubricants, properties of a good lubricants, Flash, and fire point and cloud point, emulsification number, viscosity. Paints and Varnishes : Meaning, ingredients and characteristics of good paints and varnishes, their engineering applications.

FUELS, FIRE EXTINGUISHERS AND EXPLOSIVES : Classification of fuel, gross and net calorific value, Determination of a solid fuel by bomb calorimeter , octane and octane number. Proximate analysis of fuel, its utility, crude petroleum, products of fractional distillation . Fire extinguishers - Description and use. Explosives - Meaning, types, characteristic and use of explosives. Name Dynamite, lead azide, T.N.T., Picric acid, R.D.X. Pollution and control: Introduction and chemical toxicology, air and water pollution, control of air and water pollution. Harmful effect of different gases like carbon mono-oxide, carbon dioxide, sulphur dioxide, nitric oxide, nitrous and lead.

Reference Books

1. Physical Chemistry, Bahl and Tuli
2. Inorganic Chemistry, Satyaprakash
3. Modern Text Book of Applied Chemistry, Dr. G. C. Saxena, Jain Prakashan, Indore
4. Applied Chemistry, Dr. G. C. Saxena, Deepak Prakashan, Gwalior
5. Applied Chemistry, Shrivastava & Singhal, Pbs Publication, Bhopal
6. Engineering Chemistry, Uppal
7. Engineering Chemistry, – Rao And Agarwal
8. Engineering Chemistry, P.C. Jain
9. Polymer Chemistry, O.P. Mishra
10. Applied Chemistry, H.N. Sahni, Deepak Prakash

List of Experiments

1. To identify one Anion and Cation in a given sample.
2. Determination of flesh point and fire point of a given sample of oil by Abel's apparatus.
3. Determination of viscosity by Red Wood Viscometer no. 1 and no.2.
4. Redoximetry Titration :
   a. Percentage of Iron in given sample of alloy.
   b. Determination of strength of ferrous ammonium sulphate.
   c. Determination of strength of anhydrous ferrous sulphate and ferrous sulphate.
5. Determination of hardness of water by :
   a. EDTA Method and Soap Solution Method
6. Determination of solid content in the given sample of water.
7. Determination of percentage of moisture in the given sample of coal by proximate analysis.

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BASIC ENGG. - I (BTCT-0104)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTCT-0104	Basic Engg.- I	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

UNIT – I **Marks :16**

ALGEBRA: Permutation- Meaning of factorial n, Permutation of 'n' dissimilar thing taken 'r' at a time. Combination Combination of n dissimilar things taken 'r' at a time, Binomial Theorem, Statement of the theorem for positive integer General Term, Middle term, Constant term, Partial Fractions, Define a proper-improper fraction, Break a fraction into partial fraction whose denominator contains Linear, Repeated linear and Non repeated quadratic factors. Determinant, Concept & principles of determinants, Properties of determinant, Simple examples. Complex Numbers, Algebra of Complex

UNIT – II **Marks :16**

TRIGONOMETRY : Allied angles. Trigonometrical ratios of sum and difference of angles, (Only statement), Sum and difference of trigometric ratios (C-D formula), Multiple angles (Only double angle and half angle), Properties of triangle (without proof).

MATRIX : Definition of Matrix. Types of Matrix. Row, Column, Square, Unit, Upper and lower triangular, Symmetric & Skew Symmetric, Singular and non Singular Matrices. Adjoint of a Matrix. Inverse of a Matrix.

UNIT – III **Marks :16**

CO-ORDINATE GEOMETRY : Co-ordinate System : Cartesian and Polar. Distance, Division, Area of a triangle. Locus of a point and its equation. Slope of St. Line, Angle between two St. lines. Parallel and perpendicular St. lines. Standard and general equation of St. line. Point of intersection of two st lines.

STATISTICS : Measures of Central tendency (Mean, Mode, Median), Measures of Dispersion (Mean deviation, standard deviation).

UNIT – IV **Marks :16**

DIFFERENTIAL CALCULUS : Define constant, variable, function. Value of the function. Concept of limit of a function. Definition and concept of differential coefficient as a limit. Standard results. Derivatives of sum, difference, product, quotient of two functions. Diff coeff. of function of a function. Diff. coeff. of implicit function. Logarithmic Differentiation. Differential coeff. of Parametric function.

UNIT – V **Marks :16**

INTEGRAL CALCULUS : Definition as a inverse process of differentiation, Standard Results (including inverse function), Methods of Integration, Substitution, Integration by parts, Breaking up into partial fraction, Concept of Definite Integral.

VECTOR ALGEBRA : Concept of Vector and Scalar Quantities. Different types of vectors. Addition and subtraction of vectors. Components of a vector, Multiplication of two vectors: Scalar Product, Vector Product, Applications (Work done, power & reactive power).

Reference Books

1. Differential Calculus, Gorakh Prasad.
2. Integral Calculus, Gorakh Prasad.
3. Co-ordinate Geometry, S.L. Loni.
4. Engineering Mathematics, Dr. S.K. Chouksey & Manoj Singh.
5. Mathematical Statistics, Ray and Sharma.
6. Higher Engineering Mathematics, B.S. Grewal.

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Semester-II

Applied Mechanics (BTCT-0201)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTCT-0201	Applied Mechanics	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I — Marks :16

COMPOSITION AND RESOLUTION OF FORCES

Definition , Effect, characteristics of force,System of Forces,Principle of Transmissibility of Forces, Concept of Resultant Force,Law of –Parallelogram of Forces, Triangle of Forces, Polygon of Forces, Determination of Resultant of two or more concurrent forces (analytically andgraphically)

PARALLEL FORCES AND COUPLES

Classification of Parallel Forces, Methods of finding resultant Force of parallel forces- analytically & graphically,Position of resultant force of parallel forces- Definition, Classification and characteristics of a force Couple, moment of couple

UNIT – II — Marks :16

MOMENTS AND THEIR APPLICATIONS

Definition, Types and law of moment-Varignon's Principle of moment and its applications Lever and its Applications. Types of supports and determination of support reactions of a simply supported beam subjected to point load and uniformly distributed load (UDL).

EQUILIBRIUM OF FORCES

Equilibrium of a system of concurrent forces, Conditions and types of Equilibrium Lami's Theorem and its applications.

UNIT – III — Marks :16

CENTRE OF GRAVITY

Difference between Centroid and Center of Gravity (CG), Centroid of standard plane figures and CG of simple solid bodies, Method of finding out Centroid of composite plane laminas and cut sections, Method of finding out CG of Composite solid bodies.

FRICTION

Concept and types of friction, Limiting Friction, coefficient of friction, angle of friction, angle of repose, Laws of friction (Static and Kinetic), Analysis of equilibrium of Bodies resting on Horizontal and inclined Plane,Utility / Nuisance value of friction.

UNIT – IV — Marks :16

SIMPLE LIFTING MECHINES

Concept of lifting Machines, Definition of Mechanical Advantage, Velocity Ratio and Efficiency of Machines and their relation Reversibility of Machines and condition for self locking machine, Law of Machines, Maximum mechanical advantage and maximum efficiency of machine, Friction in machine (In terms of Load and effort), Calculation of M.A., V.R. and efficiency of following machines, Simple wheel and axle Differential wheel and axle Single purchase crab Double purchase crab Simple screw jack, Different System of simple pulley blocks.

MOTION OF A PARTICLE

Definition of speed, velocity, acceleration, uniform velocity, uniform acceleration and variable acceleration, Motion under constant acceleration/ retardation (equations of motion) Motion under force of gravity, Concept of relative velocity, Definition of projectile, velocity of projection , angle of projection, time of light, maximum height, horizontal range and their determination, Definition of angular velocity, angular acceleration and angular displacement,

Relation between linear and angular velocity of a particle moving in a circular path,Motion of rotation under constant angular acceleration.

UNIT – V **Marks :16**

LAWS OF MOTION

Newton's Laws of motion and their applications.

WORK, POWER AND ENERGY

Definition unit and graphical representation of work, Definition and unit of power and types of engine power and efficiency of an engine. Definition and concept of Impulse, Definition, unit and types of energies, Total energy of a body falling under gravity.

Reference Books

1. A text book of Applied Mechanics – R.S. Khurmi , S.C. Chand & Co. , New Delhi
2. Applied Mechanics – I.B. Prasad, Khanna Publishers, New Delhi
3. Applied Mechanics (Hindi) – R.S. Jog, Anand Publishers, Gwalior Applied

List of Experiments

1. Verification of laws of parallelogram of forces.
2. Verification of laws of polygon of forces
3. Verification of laws of moments
4. Determination of forces in the members of Jib Crane
5. Determination of Centroid of plane lemina by graphical method
6. Determination of coefficient of friction for surfaces of different materials on horizontal plane
7. Determination of coefficient of friction for surfaces of different materials on an inclined plane Determination of mechanical advantage, velocity ration and efficiency of the following lifting machines.
8. Simple wheel and axle Differential wheel axle Single purchase crab Double purchase crab Simple pulley block Simple screw jack
9. Measurement of B.H.P. of an engine using roap break dynamometer

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Environmental Engineering and Safety (BTCT-0202)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min		(d) =	Max	Min		(h) =	(i) =	
						(a)	(b)	(c)	(a+c)	(e)	(f)	(g)	(e+f)	(d+h)	
BTCT-0202	Environmental Engineering and Safety	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I **Marks :16**

INTRODUCTION TO ENVIRONMENT.

The Biosphere, biotic and abiotic, An aquatic ecosystem, Types of pollution, Impact of human being on environment, Impact of environment on human being, Basic approach to improve environmental qualities, Roll of an environmental engineer.

AIR POLLUTION SOURCES AND EFFECTS.

Standard definition of air pollution, Composition of natural air, Names of air pollutants, Classification of air pollutants, primary and secondary pollutants, Classification of source of air pollutants on different bases, Definition of different types of aerosols, Effect of air pollution on: human health, material properties, vegetation, Major toxic metals and their effects, Major environmental phenomenon e.g., acid rain, global warming, green house effect, ozone layer depletion, Air quality standards, Brief description of air pollution laws.

UNIT – II **Marks :16**

METEOROLOGICAL ASPECTS OF AIR POLLUTANT DISPERSION.

Meteorological parameters influencing air pollution, Environmental laps rate, temperature inversion, atmospheric stability and adiabatic loss rate, Turbulence, topographical effects, Plume behavior, looping, coning, fanning fumigation, lofting , trapping.

AIR POLLUTION CONTROL METHODS AND EQUIPMENTS.

Natural purification processes of air,Artificial purification methods of air, Brief description of following control equipments along with sketch e.g, gravitation settling chamber, cyclone, scrubber, bag house filter, electrostatic precipitator, Brief description of following processes for the control of gaseous pollutants e. g., absorption, adsorption, condensation, combustion etc.

UNIT – III **Marks :16**

WATER POLLUTION SOURCES AND CLASSIFICATION.

Water resources, Uses of water, Classification of water,Origin, composition and characteristics of domestic waste water as well as industrial waste water, Biochemical oxygen demand, Water pollution laws and standards, Uses of waste water,Classification of waste water, Chemical oxygen demand.

WASTE WATER TREATMENT METHOD.

basic processes of water treatment. Meaning of primary, secondary and tertiary treatment.Flow chart of a simple effluent treatment plant, Theory of indusrial waste treatment,Volume reduction, neutralization and proportioning.

UNIT – IV **Marks :16**

SOLID WASTE MANAGEMENT.

Sources and classification of solid waste, Public health aspects, Disposal methods – open dumping , sanitary , land fill. Incineration , compositing, Potential methods of disposal, Recovery and recycling of paper, glass, metal and plastic.

NOISE POLLUTION AND CONTROL.

Sources of noise pollution, Units of Noise pollution measurement, Allowable limits for different areas, Problems of noise pollution and measures to control it, Noise pollution control devices brief

discussion.

UNIT – V **Marks :16**

SAFETY PRACTICES

Responsibility of employees and employers regarding health and safety, Fire hazards ,prevention and precautions, Industrial hazards prevention and protection, Protection from air and noise pollution.

Reference Books

1. Environmental pollution control Engineering by C.S. Rao.
2. Air pollution and control by Seth.
3. Air pollution by M.N Rao.

List of Experiments

GROUP A AIR POLLUTION (Any one experiment may be selected from this group)

1. Air monitoring and determination of SPM , CO, Nox, SO2 with high volume sampler.
2. Monitoring of stack gases and determination of SPM , CO, Nox, SO2 with slack monitoring kit.

GROUP B NOISE POLLUTION

3. Determination of sound pollution in (a) Auditorium (b) Factories (c) Busy roads (d) Theatre (e) TV rooms (select any three situations)

GROUP C INDUSTRIAL WASTE WATER (Any Two experiment may be selected from this group)

4. Determination of BOD/COD ratio in industrial waste water.
5. Determination of Ph and alkanity/ acidity in industrial waste water.
6. Determination of solids in industrial

GROUP D POLLUTION STANDARDS(Any Two experiment may be selected from this group)

7. Study of drinking water standards.
8. Study of effluent standards for water disposal.
9. Study of air pollution standards.

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Introduction to Computers (BTCT-0203)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max	Min		(d) =	Max	Min		(h) =	(i) =	
						(a)	(b)	(c)	(a+c)	(e)	(f)	(g)	(e+f)	(d+h)	
BTCT-0203	Introduction to Computers	3	1	2	6	80	25	20	100	50	15	50	100	200	03 Hrs

UNIT – I **Marks :16**

INTRODUCTIONTO COMPUTERS

Basic Concepts-Generations of Computers Overview of computer Systems Classifications of Computers Characteristics of Computes Applications of Computers. Numbers System & Codes-Decimal, Binary, Octal, Hexadecimal Conversions from one system to other Binary Coded Decimal & ASCII Code. Computer Hardware: Input Devices-Keyboard, Mouse, Trackball, Joystick, Scanner, OMR OCR Bar-Code Reader, MICR, Digitizer, Card Reader, Voice Recognition, Web Cam, Video Cameras, Etc. Output Devices-Monitors, Printers : Dot matrix, Inkjet & Laser, Plotters, Commuter, Output Micro Film (COM), Multimedia Projector, Speech Synthesizsr, Dumb, Smart & Intelligent Terminal.Storage Devices

UNIT – II **Marks :16**

Primary and Secondary Storage- Characteristics and Limitation, Floppy, Hard disk, CD ROM DVD, Disk Cartridge. Microprocessor-Registers, Arithmetic Unit, Control Unit, Buses, Instruction Set, Processor Speed.,Memory Concepts. Concept of Memory-Unit of Memory, Types of Memory, RAM,ROM, PROM, EPROM, EEPROM, Cache Memory. Computer Software-System Software Vs Application Software, Operating System Programs, Language Processor, Assembler, Compiler & Interpreter,Application Software, Types of Application Software and their examples., High Level Language, Low Level Language, Assembly Language. Multimedia-Basics of Multimedia,Components- Text, Graphics, Animation, Audio, Images & Video. Multimedia Applications.

UNIT – III **Marks :16**

OPERATING SYSTEM

Overview of DOS- Internal Commands, External Commands. Windows Operating System-Overview of different versions of Windows Characteristics and Facilities of Windows, Terminologies of Windows – Desktop, Icon, Menu etc. Components of Desktop. Working with Files and Folders. Windows Utilities and Accessories – Notepad, WordPad, Paintbrush, Windows Explorer, Calculator. Introduction to Linux- An overview of Linux, Basic Linux elements System, Features Software, Features File structure, Linux H/W & S/W requirements.

UNIT – IV **Marks :16**

WORD PROCESSING

Saving, Closing, Opening of documents, Selecting text Editing text, Finding and replacing text\ Printing documents, Merge Documents. Character and paragraph Formatting, Page Design and layout. Spell Check, Creating Tables and Charts. Handling Graphics

SPREADSHEET PACKAGE

Spreadsheet concept – Need, advantage, Terminology like cell, row, column etc. Working with Spreadsheet– Creating, Saving, Editing and printing, Entering data – Entering number, text, date, time etc. Selecting cells – Cut, copy, paste date, Editing Worksheet data. Formatting – Text and Cells, Applying border shading, background patterns, conditional formats, positioning cells, formatting numbers, text, Date, time. Creating formulas- Entering, Editing, Using Functions, Controlling calculations. Working with Charts- Creating charts, Adding & changing text,

changing the view and display, types of charts. Presentation Software: Introduction Presentation design tools Presentation terminologies, Creating, Opening and Saving Presentation. Working with different views Creating and Organizing slides, Adding and Formatting text in slides Formatting paragraphsm Adding drawings and objects Creating special effects Working with table and charts Printing Presentation.

UNIT – V **Marks :16**

DATABASE

Introduction – need, Characteristics and terminologies of database, Types of database – relational, Hierarchical and Network. Basic entities – Tables, records, Data types, Data, Validation and constraints, keys relation between tables. Query – Select, Insert, Update, Delete. Forms – Creating forms, Forms controls Report Designer- Customize formats, grouping reports. Computer Communication & Networks: Information Networks- The Technology of Workgroup Computing, Types of network, Network topology.Network components. Data Communication-Introduction to Data Communication,Types of Data,Transmission media. Internet and E-mail- Internet Basics, Websites- Applications, terminologies, naming conventions., Web Browsers- Types, Navigation and tools, E-mail – concept, terminologies, mailing services provider, advantages comparison with Conventional mailing. Search engine – concept, search engine websites, searching methods.

Text Books

1. S . Jaiswal, A First Course in Computers, Golgotha Publication
2. Slotnick, Butterfield, Colantonio and Kopetzky, Computers & Application, C.C. Health & Company
3. Ron Mansfield, The Complete Guide to Microsoft Office Professional, Sybex /BPB Asian Edition
4. Hardware Bible, BPB Publication
5. Learning Windows in 24 Hours, Sam Techmedia

Reference Books

1. Suresh K. Basandra, Computers Today, Galgotia Publication
2. Norton Peter, Inside IBM PC
3. Computer Hardware, Osborne Series
4. Hardware Bible, BPB Publication
5. Learning Windows in 24 Hours, Sam Techmedia
6. Chapman, Understanding windows, BPB Publication

List of Experiments

1. Study of various components of computer like CPU, keyboard, mouse, monitor, printer, CVT and storage devices.
2. Internal and external commands of DOS.
3. Using Windows operating system, study of desktop, control panel, accessories and settings.
4. File management in windows explorer, Study of WordPad, NotePad, PaintBrush, Calculator etc. Study of Linux operating system.
5. Study of MS-word – opening and saving of documents, formatting, editing and spell check, find and replace, printing, merging. Creating Table, Charts and Graphics.
6. Study of Spreadsheet – creating, saving, editing and printing. Entering data, selecting cells, formatting text, applying border shades and backgrounds, creating formulas, creating charts.
7. Study of Power Point – creating, opening, editing and saving of slides. Adding and formatting text, creating, animations, working with images and special effects. Printing presentation.
8. Study of MSAcess– creating, saving, editing and printing of tables. Managing relationships, writing queries e.g. SELECT, UPDATE, DELETE, INSERT. Forms designing and report printing.
9. Study ofWeb Browser and mailing programs.

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Engineering Drawing (BTCT-0204)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTCT-0204	Engineering Drawing	3	1	-	4	80	25	20	100	-	-	-	-	100	03 Hrs

UNIT – I **Marks :16**

INTRODUCTION TO DRAWING INSTRUMENTS:

Introduction of drawing instruments, materials and their uses, Applications of minidrafter Applications of compass and divider Applications of French curves and spline Pencils grades and their uses, Designation and sizes of drawing sheet and drawing board.

PLANNING AND LAYOUT OF DRAWING SHEET:

Planning of drawing sheet as per I.S.: 696-1972 (SP 46: 1988). This should include- Margin, Title Block, Zoning, Revision panel, Folding marks, Numbering of sheet.

CONVENTIONAL REPRESENTATION:

Conventional representation of the following as per BIS practice.Common Engineering materials Electrical installations and fittings – Main switches, (lighting and power), socket outlets (3 pin 5AMP, 3pin15AMP), bell, buzzer, loud speaker, Aerial, ceiling fan, exhaust fan, Bracket fan, fan regulator, battery and earth point.

Electronics components- Diode: Zener, varactor, Scotty, step recovery, light emitting diode (LED), PNP and NPN transistors, résistance, capacitor, Inductors (fixed and variable both), IC (8pin and 14pin), SCR, TRIAC, DIAC, UJT, FET, MOSFET, LOGIC GATES.

Sanitary fittings- showerhead, wall lavatory basin, corner Lavatory basin, urinal stall, kitchen sink, Indian type WC, Water closets (Asian pan, urissapan, Anglo-Indian, European)

Building -single and double swing doors and windows.

Mechanical components- Internal and external threads, slotted head, Square end and flat, radial arms and ribs, serrated shaft, splined shaft, Chain wheel, bearing, straight and diamond knurling, Compression and tension spring, leaf spring (with and without eye), Spur and helical gear.

LINES, LETTERING AND DIMENSIONING:

Introduction of type of lines and their applications, Single stroke vertical, inclined letters (capital and lowercase) And numerals. Dimensioning: Elements of dimensioning- dimension line, extension line, arrowhead And leader line. Dimensioning system – Aligned and unidirectional. Dimensioning of Arcs and Circles. Angular Dimensioning.Dimension of counter sunk and counter bore.

UNIT – II **Marks :16**

GEOMETRICAL CONSTRUCTIONS AND ENGINEERING CURVES

Divide a line into any number of equal parts by parallel line method, Bisecting of line and angle. Construction of triangles and polygons Introduction of conic sections (curves), Construction of Ellipse by Eccentricity and Concentric circles methods, Construction of Parabola by Eccentricity and Rectangle methods, Construction of Hyperbola by Eccentricity method, Construction of Cycloid, Construction of Involutes of circle and polygon, Construction of Archemedian Spiral of any number of convolutions.

SCALES:

Introduction of scales and their applications, Concept of reducing, enlarging and full size scale Classification of scales – plain, diagonal, vernier, Scale of chord and comparative scales Definition of R.F. Construction of plain and diagonal scales.

UNIT – III **Marks :16**

THEORY OF PROJECTION AND PROJECTION OF POINTS, LINES AND PLANES

Definition of various term associated with theory of projection- Planes of projection, Quadrants, first & third angle projection method, Projection of points in all the four quadrants. Projection of linesparallel to HP and VP both, perpendicular to one plane and parallel to other, Inclined to one plane and parallel to other, knowledge of projection of line inclined to both the plane, (No practice required).

Projection of planes – Perpendicular to HP and VP both, Perpendicular to one plane and parallel to other, Inclined to one plane and perpendicular to other, Knowledge of projection of plane inclined to both the planes.

UNIT – IV **Marks :16**

PROJECTIONS OF SOLIDS:

Projection of cylinder, cone, prism and pyramid. Under the conditions :- Axis parallel to HP and VP, Axis perpendicular to HP and parallel to VP, Axis perpendicular to VP and parallel to HP, Axis inclined to HP and parallel to VP, Axis inclined to VP and parallel to HP, Axis inclined to both HP and VP.

SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES:

Section of cone, cylinder, prism and pyramid (Solid resting on its base in the HP i.e. the Axis perpendicular to HP and parallel to VP) in the cases:- Section plane parallel to HP and perpendicular to VP, Section plane parallel to VP and perpendicular to HP, Section plane inclined to HP and perpendicular to VP, Section plane inclined to VP and perpendicular to HP. Drawing True shape of section.

Introduction to development of lateral surface of solids- Cone, Cylinder, Prism and Pyramids (Simple and truncated). Under the condition – solid resting on its base in the HP and axis Perpendicular to HP and parallel to VP. Development of funnel and elbow.

INTERSECTION OF SURFACES

Intersection of following cases – Cylinder to cylinder and Prism to prism (With their axis intersecting and perpendicular to each other.)

UNIT – V **Marks :16**

ORTHOGRAPHIC PROJECTIONS & FREE HAND SKETCHING:

Principles of orthographic projections- Identification of necessary views and superfluous view Selection of front view. Preparation of necessary orthographic views of simple objects From given pictorial views. Dimensioning of orthographic views as per standard practice. Free hand sketches of simple objects (Using Pencil, Eraser & Paper only)

ISOMETRIC VIEWS

Concept of isometric projection and isometric view (Isometric Drawing), Construction of isometric scale, Construction of isometric view of polygon and circle, Construction of isometric view of cone, cylinder, prism and pyramids, Construction of isometric view of simple objects from given orthographic views.

Text Books

1. ENGINEERING DRAWING – N.D. Bhatt
2. ENGINEERING DRAWING – R.K. Dhawan
3. ENGINEERING DRAWING – P.S.Gill

Reference Books

1. ENGINEERING DRAWING – P.S.Gill
2. SP: 46-1988 Bureau of Indian standard
3. PRINCIPLES OF ELECTRONICS - Malvino

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Computer Science
(BTCT-0205)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTCT-0205	Computer Science	-	-	2	2	-	-	-	-	100	30	200	300	300	

UNIT – I **Marks :16**

PROGRAMMING FUNDAMENTALS

Computer Basics; Program Development Life Cycle: Flow Chart, Algorithm, Compilation and Execution; Introduction to C Language: program structure, variables, keywords, data types; Input / Output functions: scanf, printf; simple programs.

UNIT – II **Marks :16**

DECISION AND LOOP CONTROL STRUCTURE

Logical operators; Decision statements: if/else, switch/case statements; Loop control statements – for, while, do/while.

UNIT – III **Marks :16**

ARRAYS AND FUNCTIONS

Arrays: Introduction to arrays; One dimensional array: declaration, reading and printing array elements, sorting and searching. Functions: Definition; declaration of functions; return statement;recursion.

UNIT – IV **Marks :16**

INTRODUCTION TO OOP CONCEPTS

OOP concepts: classes and objects, encapsulation, inheritance, overloading, polymorphism, constructor and destructor, data hiding,simple program in C++.

UNIT – V **Marks :16**

INHERITANCE AND OVERLOADING

Inheritance – single, multiple, multilevel; Overloading – Function overloading, Operator overloading.

Text Books

1. Kanetkar P.Yashwant, “Let us C”, BPB publications, 2002.
2. Ashok N.Kamthane, “Programming with ANSI and Turbo C”, Pearson Education, 2006.
3. Herbert Schildt, “The Complete Reference C++”, TataMcGrawHill, 2001, 3rd Edition.
4. Robert Lafore, “Object Oriented Programming in Microsoft C++”, The Waite Group, Galgotia Publications Pvt. Ltd., 2002.

Reference Books

1. Robert Lafore, “Object Oriented Programming in Microsoft C++”, The Waite Group, Galgotia Publications Pvt. Ltd., 2002.

Engg. Graphics Lab (BTCE-0206)

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Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTCE-0206	Engg. Graphics Lab	-	-	2	2	-	-	-	-	50	15	50	100	100	

UNIT – I **Marks:16**

FUNDAMENTALS OF ENGINEERING GRAPHICS

Lettering, two dimensional geometrical constructions, conics, representation of three-dimensional objects – principles of projections – standard codes – projection of points.

UNIT – II **Marks:16:**

PROJECTION OF LINES AND SOLIDS

Projection of straight lines, projection of solids – auxiliary projections

UNIT – III **Marks:16**

SECTIONS AND DEVELOPMENTS

Sections of solids and development of surfaces.

UNIT – IV **Marks:16**

PICTORIAL PROJECTIONS

Conversion of projections: Orthographic projection, isometric projection of regular solids & combination of solids.

UNIT – V **Marks:16:**

BUILDING DRAWING

Building Drawing – plan, elevation and section of single storied residential (or) office building with flat RCC roof and brick masonry walls having not more than 3 rooms (planning / designing is not expected in this course).

Text Books

1. Jeyapoovan, T., Engineering Drawing and Graphics using AutoCAD 2000, Vikas Publishing house Pvt Ltd, NewDelhi, 2005.
2. Narayanan, K.L & Kannaiah, P., Engineering Graphics, Scitech Publications, Chennai, 1999.

Reference Books

1. Bhatt, N.D., Elementary Engineering Drawing (First Angle Projection), Charotar Publishing Co., Anand, 1999.
2. Venugopal, K. Engineering Drawing & Graphics, New Age international Pvt. Ltd., 2001.
3. Natarajan, K.V. Engineering Drawing & Graphics, Private Publication, Chennai, 1990.

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Seminar/GD/Lang. Lab (BTCE-0207)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTCE-0207	Seminar/GD/Lang. Lab	-	-	2	2	-	-	-	-	-	-	50	50	50	

UNIT – I **Marks:16:**

Topics to be covered in the Language Lab Sessions:
Introduction session: Introduce oneself, Family background, Educational qualification, Hobbies and interest, Expertise, Experience (If any), Strength and weaknesses.

UNIT – II **Marks:16:**

Body language: Importance of body language, Dressing sense, Walking sense, Talking and communication, Dining and eating sense.

UNIT – III **Marks:16**

Telephonic etiquettes: How to receive calls, How to respond, How to make a call, Common expressions for calling.
PPTs presentations:
Improving speaking skills: Speech practices, Role plays (on stage), GD and Debate, Extempore speech, Word games, JAM (Just a minute) session, Describing objects and situations.

UNIT – IV **Marks:16**

Reading skills: Improving reading skills, Paragraph reading, Storytelling and reading, Audio and video sessions.

UNIT – V **Marks:16**

Writing skills: Paragraph writing, Word power/ vocabulary building, Article writing, Translations from Hindi to English and vice-versa.
Presentation skills: Oral presentations, on all the learning sessions. Seminar on given topics.

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Project work-II (BTCE-0208)

Paper Code	Title of the paper	Period Per Week				Distribution of Marks								Grand Total	Duration of Exam
						Theory		MST	Total	Practical		TW	Total		
		L	T	P	C	Max (a)	Min (b)	(c)	(d) = (a+c)	Max (e)	Min (f)	(g)	(h) = (e+f)	(i) = (d+h)	
BTCE-0208	Project work-II	-	-	4	4	-	-	-	-	-	-	50	50	50	

The objectives of the course 'Project work' are

1. To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.

2. To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.

3. To give students an opportunity to do some thing creative and to assimilate real life work situation in institution.

4. To adapt students for latest developments and to handle independently new situations.

5. To develop good expressions power and presentation abilities in students.

The faculty and student should work according to following schedule:

i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.

ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.

iii) At all the steps of the project, students must submit a written report of the same.

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Semester-III

BTCT-0301 ENGINEERING MATHEMATICS – III

Course code	Title of the paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-301	ENGINEERING MATHEMATICS – III	3	1	-	4	80	25	20	100	-	-	-	-	100	3 hrs

UNIT- 1 **MARKS: 16**

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals

UNIT- 2 **MARKS: 16**

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

UNIT- 3 **MARKS: 16**

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

UNIT- 4 **MARKS: 16**

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

UNIT- 5 **MARKS: 16**

Concept of Probability : Probability Mass function, Probability density function. Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution ,Gamma Distribution ,Beta Distribution ,Testing of Hypothesis |:Students t-test, Fisher's z-test, Chi-Square Method .

Recommended Books:

1. Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
2. Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
3. Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication.
4. Numerical Methods using Matlab by Yang,Wiley India.
5. Pobability and Statistics by Ravichandran ,Wiley India.
6. Mathematical Statistics by George R., Springer.

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BTCT-0302 GEOLOGY OF RAW MATERIALS

Course Code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0302	Geology Of Raw Materials	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs

Objectives:

To enable students to understand the basics and application of geology in ceramic technology

Outcome:

Have learnt the origin, development and ultimate fate of various surface features of the earth, the basic characteristics of ceramic minerals which are available in the earth crust, the nature of geographic distribution of minerals and rocks, and their physical properties, the nature of geological structures and their importance, the importance of geology in ceramic engineering practices.

UNIT-1 Marks:16

General geology: Introduction, branches of geology, internal structure of earth, Use of geology in ceramic field. **Mineralogy:** Definition of mineral, chemical composition and important physical properties of minerals, (as mentioned in practical) such as color, streak, hardness, cleavage, fracture, tenacity, luster, diaphaneity and specific gravity.

UNIT-2 Marks:16

Crystallography: Definition and characteristic features of crystals. Symmetrical characters and classification of crystal system

UNIT-3 Marks:16

Petrology: Elementary and general ideas about rocks and their formation, classification into Igneous Sedimentary and Metamorphic rocks. Study of physical properties, occurrence and uses of rocks given in practical. Brief study of igneous, sedimentary and metamorphic rocks.

UNIT-4 Marks:16

Structural geology: Elements of structural geology, brief description of unconformity, folds, faults, and joints, with examples. **Stratigraphy:** General principles of stratigraphy, tripartite physiographic divisions of India. Broad outline of the stratigraphy of India.

UNIT-5 Marks:16

Economic geology and industrial mineral deposits: Economic use of rocks and minerals, brief study of important processes of formation of mineral deposits. Simple classification of mineral deposits, Description and distribution of the following economic mineral deposits in India. Mica, Gold, Clay, Feldspars

Zirconium. Study of natural occurring minerals such as Beryl, Magnetite, Dolomite, Limestone, Barites, Quartzite, Sillmnite, Kyanite, Calcite, Bauxite, Chromites.

Recommended Books:

1. Parbin Singh, "Engineering and General Geology ", Katson Publication House, 1987.
2. Garg S. K., "Physical and Engineering Geology", Khanna Publication, New Delhi, 1999
3. P.K. Mukherjee, “A text book of geology”
4. Legeet, "Geology and Engineering", McGraw Hill Book Company, 1998.
5. Blyth, "Geology for Engineers", ELBS, 1995.
6. M. T. Maruthesha Reddy, "Engineering Geology Practical", New Age International Pvt Ltd, 2003
7. Read, H.H. Rutley's Elements of Mineralogy, CBS Publisher, 1991.
8. Billings, M.P. Structural Geology, Prentice Hall Inc., 1992.
9. Gokhale, KV.G.K. and Rao, D.M. Experiments in Engineering Geology, Tata McGraw Hill, 1981

LIST OF EXPERIMENTS:

1.Study of physical properties of the following minerals in hand specimen: Quartz, orthoclase, albeit, abradorite, muscovite mice, biotite mica, hornblende, augite, garnet, kyanite, silliminite, pyrolusite, chromites, magnetite, fluorite, rutile, monazite, vermiculite, hematite, galena, pyrite, chalcopyrite, gypsum, corundum, barytes, zircon, asbestos, talc, tourmaline, cordierite, limonite, clay and clay minerals.

2. Study of optical properties of the following minerals under microscope: Quartz, albite, labradorite, calcite, hornblende, augite, tourmaline, muscovite mica, biotite mica, kyanite, garnet, silliminite, chlorite, gypsum, orthoclase, microcline.

3. Study of physical properties of the following rocks in hand specimens:
a) Igneous rocks: Granite, pegmatite, syenite, basalt.
b) Sedimentary rocks: Sand stone, shale, limestone, conglomerates and breccias.
c) Metamorphic rocks: Schist, gneiss, quartzite, slate.

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BTCT-0303 FUELS, FURNACES AND PYROMETRY

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0303	FUELS, FURNACES AND PYROMETRY	3	1	2	6	80	25	20	100	50	15	50	100	200	3 hrs

Objectives:

To enable the students to have a complete knowledge of fuels used in industries, furnaces and temperature measuring devices.

Outcome:

Have learnt about occurrence and characteristics of different solid fuels, liquid fuels and gaseous fuels. Have learnt about combustion calculations and testing of fuels, have learnt about heat recovery systems and temperature measuring devices.

UNIT- 1 Marks-16

Wood and charcoal, coals, Occurrence and distribution of coals in India, High and low temperature coal carbonization, coke manufacture, pulverized coal.

UNIT- 2 Marks-16

Petroleum, its origin and occurrence, distillation of crude, products of distillation. Natural gas, LPG, coal gas, producer gas, water gas, etc. Calorific value of fuels. Nuclear fuels and nuclear reactors.

UNIT- 3 Marks-16

General classification of furnaces, study of different types of furnaces. Furnaces and kilns used in ceramic, cement and metallurgical industries.

UNIT- 4 Marks-16

Calculations pertaining to furnaces and kilns. Regenerators, recuperators and waste heat boilers. Study of electric furnaces (resistance, induction, arc, dielectric heating) and heating elements.

UNIT- 5 Marks-16

PUMPING

Different temperature measuring devices (resistance and thermoelectric pyrometers), Study of radiation, optical and total radiation pyrometers.

Recommended Books:

1.Glass melting tank furnace – Rudolf Gunthar
2.Fuels, Furnaces and Refractories – O.P. Gupta
3.Pyrometry – W.P. Wood & J.M. Cork
4.Industrial Furnaces – W. Trinks
5.General theory of furnaces – M.A. Glinkov et. al.
6.Fuels, Furnaces and Refractories – J.D. Gillchrist et al.
7.Modern Furnace Technology – H. Etherington.
8.Handbook of Glass manufacture – F.V. Tooley .
9.Efficient use of fuels – HMSO – Brime and King.
10.Fuels Technology – Himus

Name of experiments:-

1. Determination of Compressive strength.
2. Determination of Insoluble residue.
3. Determination of acidic oxides (So3. Sio2)
4. D etermination of Basic oxides (AI2o3, Fe2o3, Cao. Mgo)
5. D etermination of setting time.
6. Determination of loss on initiation.

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BTCT- 304 MOMENTUM TRANSFER

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-304	MOMENTUM TRANSFER	3	1	2	6	80	26	20	100	50	17	50	100	200	3 hrs

Objectives:

To enable students to know about fluids, their properties and classification, to gain knowledge on energy consumption in fluid transportation, fluid transportation and metering, dimensional analysis and similitude.

Outcome:

Have learnt about types of fluids, and basic properties, pressure measurement devices, energy requirement for pumping of fluids, pipe fittings and valves, fluid transportation, unsteady flow, development of equations for flow phenomena, and similitude.

UNIT- 1 Marks-16

Fluid statics and its applications: Concept of UNIT- operations, concept of momentum transfer. Nature of fluids and pressure concept. Variation of pressure with height – hydrostatic equilibrium, barometric equation, measurement of fluid pressure – manometers.

UNIT- 2 Marks-16

Fluid flow phenomena and basic equations: Newtonian and non-newtonian fluids, types of flow. Reynolds number. Reynolds stress, Eddy viscosity. Flow in boundary layer, boundary layer separation and wake formation. Basic equation of fluid flow. Euler and Bernoulli's equation, correction factors. Pump work in Bernoulli's equation.

UNIT- 3 Marks-16

Flow of incompressible fluid in conduits: Laminar flow through circular conduits, Hagen Poiseuille equation, turbulent flow in pipes. Friction factor. Flow of fluids in thin layers.

UNIT- 4 Marks-16

Transportation and metering of fluids: Pipe fittings and valves, measurement of fluid flow rate by orifice and venturi meter, rota meter, pitot tube. Flow through weirs and notches. Centrifugal pump.

UNIT- 5 Marks-16

Unsteady state flow: Time to empty liquid from a tank.

Dimensional analysis: Dimensional homogeneity, Rayleigh's and Buckingham's pi methods. Dimensionless numbers. Elementary treatment of similitude between model and prototype.

Recommended Books:

1.McCabe W.L., et. al., "UNIT- Operations of Chemical Engineering", 5th ed., McGraw Hill International, Singapore, 2000.
2.Badger W.L. and Banchero J.T., "Introduction to Chemical Engineering", 3rd ed., McGraw Hill International, Singapore, 1999.
3.Coulson J.M. and Richardson J.F., "Chemical Engineering" Vol 2, Particle technology and separation processes, 4th ed., Pergamon Press.
4.Brown G.G., et. al., "UNIT- Operations", 1st ed., CBS Publisher, New Delhi, 1995.
5.Foust A.S., et. al., Principles of UNIT- Operations", 3rd ed., John Wiley & Sons., New York, 1997.

List of Experiment:

1. Friction loss is pipes
2. Orifice / Venturi meter
3. Centrifugal pump
4. Flow over notches
5. Head loss due to sudden enlargement

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BTCT- 305 MECHANICAL OPERATIONS

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-305	MECHANICAL OPERATIONS	3	1	-	4	80	25	20	100	-	-	-	-	100	3hrs

Objectives:

To enable students to know about characteristics of particulate solids, various methods and laws of powder processing, filtration, mixing of solids, conveying of solids and separation methods.

Outcome:

Have learnt powder characteristics, screening, principle and mechanism of size reduction and equipment for size reduction. Have an understanding about filtration mechanism and equipment, mixing of powders, sampling, and storage and conveying of solids and various separation methods.

UNIT- 1 **Marks-16**

Mechanical operations and their importance with reference to typical processes of ceramic and cement industries. Characterization of solid particles: Equivalent diameter, sphericity, mixed particle sizes, specific surface of mixture, average particle size. Screening: Screens – ideal and actual screens, differential and cumulative size analysis. Effectiveness and capacity of screens. Standard screens. Industrial screening equipment such as trammels, vibrating screens, grizzlies. Sieve shakers.

UNIT- 2: **Marks-16**

Size reduction: Theory and principles (laws of size reduction) involved in crushing and grinding. Classification of size reduction machinery, their construction and working. Crushers, grinders, ultrafine grinders and cutters. Problems on size reduction.

UNIT- 3: **Marks-16**

Filtration: Principles of filtration, types of filtrations: atmospheric, pressure and vacuum filtration and their applications. Constant rate and constant pressure filtration. Industrial filters – sand filter, filter press, leaf filter, rotary drum filter, bag filter and centrifugal filtration. Filter aids. Mixing: Principles involved in mixing. Types of mixing such as liquid with liquid, gases with liquids, viscous masses, solids with liquids and solids with solids. Construction and working of stirred tank mixer, sigma mixer, ribbon blender, double cone blender, pug mill etc.

UNIT- 4: **Marks-16**

Sampling, storage and conveying of solids: Sampling of solids, storage of solids, open and closed storage, bulk and bin storage. Conveyors – belt, chain, apron, bucket and screw conveyors.

UNIT- 5: **Marks-16**

Miscellaneous separation: Magnetic separation, electrostatic separation, jigging, froth floatation. Size enlargement – flocculation, briquetting, pelletization and granulation.

Recommended Books:

1.McCabe W.L., et. al., "UNIT- Operations of Chemical Engineering", 5th ed., McGraw Hill International, Singapore, 2000.
2.Badger W.L. and Banchero J.T., "Introduction to Chemical Engineering", 3rd ed., McGraw Hill International, Singapore, 1999.
3.Coulson J.M. and Richardson J.F., "Chemical Engineering" Vol 2, Particle technology and separation processes, 4th ed., Pergamon Press.
4.Brown G.G., et. al., "UNIT- Operations", 1st ed., CBS Publisher, New Delhi, 1995.
5.Foust A.S., et. al., Principles of UNIT- Operations", 3rd ed., John Wiley & Sons., New York, 1997.

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BTCT- 306 Computer Programming

Course code	Title of the paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-306	**Computer Programming**	-	-	2	2	-	-	-	-	50	15	50	100	100	3 hrs

UNIT- 1 **MARKS: 16**

Basic Java Features

C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods,Objects, trings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes.

UNIT- 2 **MARKS: 16**

Java Collective Frame Work –

Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees,

UNIT- 3 **MARKS: 16**

Advance Java Features –

Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, and Oracle

UNIT- 4 **MARKS: 16**

Advance Java Technologies –

Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

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UNIT- 5 **MARKS: 16**

Advance Web/Internet Programming (Overview):
J2ME, J2EE, EJB, XML.

Recommended Books:

1. E. Balaguruswamy, “Programming in Java”; TMH Publications
2. The Complete Reference: Herbert Schildt, TMH
3. Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson.
4. Peter Norton, “Peter Norton Guide To Java Programming”, Tec media.
5. Merlin Hughes, et al; Java Network Programming, Manning Publications/Prentice Hall.

List of Program to be perform (Expandable)

1. Installation of J2SDK
2. Write a program to show Concept of CLASS in JAVA
3. Write a program to show Type Casting in JAVA
4. Write a program to show How Exception Handling is in JAVA
5. Write a Program to show Inheritance
6. Write a program to show Polymorphism
7. Write a program to show Interfacing between two classes
8. Write a program to add a Class to a Package
9. Write a program to demonstrate AWT.
10. Write a program to hide a Class
11. Write a Program to show Data Base Connectivity Using JAVA
12. Write a Program to show “HELLO JAVA” in Explorer using Applet
13. Write a Program to show Connectivity using JDBC
14. Write a program to demonstrate multithreading using Java.
15. Write a program to demonstrate applet life cycle.

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BTCT-0307 Seminar / Group Discussion (Internal Assessment)

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-307	Seminar / Group Discussion	-	-	2	2	-	-	-	-	50	17	-	50	50	3 hrs

Objective of GD and seminar

Objective of GD and seminar to improve the MASS COMMUNICATION and INCING/Understanding skills of students and it is to give student an opportUNIT-y to exercise their rights to express themselves.

Evaluation

Evalution will be done by assigned faculty based on group discussion and power point Presentation.

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Semester-IV

BTCT-0401 CONCRETE TECHNOLOGY

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0401	Concrete Technology	3	1	-	4	80	25	20	100	-	-	-	-	100	3hrs

UNIT- I **Marks : 16**

Introduction Classification, properties, grades, advantage & disadvantages of concrete, Ingredients of concrete, types of cement, aggregates, water, admixtures, Inspection & testing of materials as per Indian Standard Specifications.

UNIT- II **Marks : 16**

Properties of Fresh and Hardened Concrete : Introduction, Workability, Testing of concrete, Factors affecting, Rheology of concrete, Compressive & Tensile strength, Stress and strain characteristics, Shrinkage and temperature effects. Creep of concrete, Permeability, durability, thermal properties & micro-cracking of concrete.

UNIT- III **Marks : 16**

Design of Concrete Mix : Various classical methods of concrete mix design, I.S. code method, basic considerations and factors influencing the choice of mix design, acceptance criteria for concrete, concrete mixes with Surkhi and other Pozzolanic materials, design of plastic concrete mix, computer aided design of concrete mix.

UNIT- IV **Marks : 16**

Production and Quality Control of Concrete : Production of crushed stone aggregate, batching equipments for production and concreting, curing at different temperatures, Concreting underwater, hot & cold weather condition, statistical quality control, field control, non-distructive testing, repair technology for concrete structures, Inspection & Testing of Concrete.

UNIT- V **Marks : 16**

Special Concretes : Light weight concrete, Ready mix concrete, Vacuum concrete, Ferrocement, Fiber reinforced concrete, Polymer concrete composites, Shotcrete, Guniting, Rubble concrete, Resin concrete, Prestressed concrete, Heat resistant concrete, Mass concrete, Temperature control of mass concrete.

Text Books

1. Gambhir ML; Concrete Technology – TMH

2. New Building Materials Published by B.M.T.P.C., New Delhi

Reference Books

1. Varshney RS; Concrete Technology; Oxfored & IBH publishing co.

2. Gambhir ML; Concrete Technology – TMH

3. Sinha SN; Reinforced Concrete Technology; TMH

4. New Building Materials Published by B.M.T.P.C., New Delhi

5. Hand books on Materials & Technology - Published by BMTPC & HUDCO

6. Mohan Rai & M.P. Jai Singh; Advances in Building Materials & Construction

7. Jackson N; Civil Engineering materials.

8. Properties of Concrete - A.M. Neville - Pearson Education

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BTCT- 0402 MATERIAL SCIENCE

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0402	MATERIAL SCIENCE	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

Objectives:

To enable the students to have a basic knowledge of crystal systems, microstructure and dependence on various properties.

Outcome:

Have learnt about the atomic structure and bonding, have studied the structure of solids and various imperfections, have learnt about the basics of phase diagrams and phase transformations, have learnt deformation of materials, heat treatment, corrosion and its prevention and about engineering materials.

UNIT- 1 **MARKS: 16**

Introduction:

Introduction to material science, classification of engineering materials, structure property relationships in materials. Crystal geometry and structure determination: Geometry of crystals, the Bravais lattices, crystal irections and planes, the miller indices. Structure determination – XRD, Bragg's law, the powder method.

UNIT- 2 **MARKS: 16**

Atomic structure, chemical bonding and structure of solids: Structure of atom, periodic table, ionization potential, electron affinity and electro-negativity, primary and secondary bonds. Variation of bonding character and properties, covalent solids, metals and alloys, ionic solids, structure of silica and silicates, polymers. Crystal imperfections: Point imperfections, line imperfections, edge and screw dislocations, the Burgers vector, line energy of dislocations, surface imperfections. Phase diagram and phase transformations: Phase rule, single component systems, binary phase diagrams, lever rule, typical phase diagrams for magnesia-alumina, copper-zinc, iron-carbon systems, nucleation and growth, solidification, allotropic transformation, cooling curve for pure iron, iron-carbon equilibrium diagram, isothermal transformations (TTT curves)

UNIT- 3 **MARKS: 16**

Deformation of materials and fracture: Elastic deformation, plastic deformation, creep, visco-elastic deformation, different types of fracture. Heat treatment: Annealing, normalizing, hardening, martempering, austempering, hardenability, quenching, tempering, carburizing, cyaniding, nitriding, flame hardening.

UNIT- 4 **MARKS: 16**

Corrosion and its prevention: Direct corrosion, electro-chemical corrosion, galvanic cells, high temperature corrosion, passivity, factors influencing corrosion rate, control and prevention of corrosion, modification of corrosive environment, inhibitors, cathodic protection, protective coatings.

UNIT- 5 **MARKS: 16**

Typical engineering materials: Ferrous metals, non ferrous metals and alloys – aluminum and its alloys, copper and its alloys, lead and its alloys, tin, zinc and its alloys. Alloys for high temperature service, ceramic materials – structure of ceramics, polymorphism, mechanical, electrical and thermal properties of ceramics, refractories, glasses, abrasives. Organic materials – mechanism of polymerization, additions to polymers, plastics, fibers and elastomers, organic protective coatings.

Recommended Books:

1. Materials Science and Engineering – A first course : Raghavan V., 3rd ed., Prentice
2. Hall of India Pvt. Ltd., new Delhi, 1996.

3. Material Science and Processes – Hajra Choudhury S.K., Indian Book Distributing Co., 1982
4. Elements of Material Science – Van Vlack H.L., 2nd ed., Addision – Wesly Pub. Co., NY, 1964.

List of Program to be perform (Expandable):

1. Hydrometer calibration
2. Particle size and particle size distribution
3. Determination of water of plasticity
4. Settling characteristics of suspensions
5. Size analysis by screening and screen efficiency
6. Determination of apparent / bulk density
7. Determination of porosity
8. Determination of specific gravity
9. Determination of water of absorption
10. Setting time of plaster of paris
11. Plasticity of clays
12. Drying shrinkage
13. Loss on ignition
14. Adsorbed moisture
15. Firing shrinkage
16. Estimation of soluble salts in clays

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BTCT- 0403 WHITEWARES & HEAVY CLAYWARES

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0403	White wares & Heavy Claywares	3	1	-	4	80	25	20	100	-	-	-	-	100	3hrs

Objectives:

To enable the students to have a knowledge of whiteware and heavy clayware products, their manufacturing process and testing of these products.

Outcome:

Be capable of classifying various whiteware products and know the body formulation and properties have learnt the preparation, characteristics and applications of whitewares products according to their end use, have an understanding about heavy clayware products and their applications, have learnt the various testing methods.

UNIT- 1 MARKS: 16

Definition, Scope and division of field, geological formation, occurrence, Civil and treatment of ceramic raw materials. Triaxial whiteware composition, crystal structure and properties of important ceramic raw materials. Particulate solids and water role in different ceramic raw materials, in pottery bodies, batch calculation, inter-conversion of batch composition to formula and batch formula to composition.

UNIT- 2 MARKS: 16

Rheology and types of fluids, Important shaping methods like jiggering, slip casting, soft mud processes, plastic forming etc., finishing, drying and firing. Glazes: Definition, types of raw materials, coloring ingredients, decorating methods, compounding and firing of glazes, blending, preparation of glaze slip, glaze application.

UNIT- 3 MARKS: 16

Heavy Clay Wares: Definition of raw materials, classification of building materials, their chemical and mineralogical composition, clay preparation and shaping. Manufacture of common building bricks and roofing tiles, hollow bricks, sewer pipe, salt glazing etc., microstructure of structural clay products.

UNIT- 4 MARKS: 16

Fine Ceramics: Manufacture of floor tiles and wall tiles, art ware, dental porcelain, bone chine, abrasion resistance, porcelain, chemical stone ware, chemical porcelain, insulators, metallized ceramics.

UNIT- 5 **MARKS: 16**

Testing: Loss on ignition, plasticity, thermal shock, corrosion resistance, abrasion resistance, refraction, optical absorption, crazing lead solubility test, Etc. Microwave safety of crockery. General Plant Layout of whitewares industries.

Recommended Books:

1. Fine Ceramics – F.H. Norton
2. Ceramic Raw Materials – Ryan
3. Introduction to Ceramics – W.D. Kingery
4. Elements of Ceramics – Norton
5. Whitewares – Jackson
6. Ceramics – P. William Lee
7. Industrial Ceramics – Singer and Singer
8. Glazes – Bull & Taylor
9. Ceramic whitewares – Rexford Newcomb
10. Heavy Claywares – F.H. Clews, Academic Press Inc. NY.
11. Ceramic batch calculations – A.I. Andrews

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LIST OF EXPERIMENTS

1. Determination of porosity of clay bodies
2. Dertermination of porosity of triaxial bodies
3. Determination of density of clay bodies
4. Determination of density of triaxial bodies
5. Determination of water of absorption of clay & triaxial bodies
6. Determination of S.G. of clay by pycnometer
7. Determination of water of plasticity.
8. Differential Thermal Analysis of Clays.
9. Differential scanning calorimetry analysis of clays.
10. Chemical analysis of clays.
11. Chemical analysis of glazes.
12. Chemical analysis of porcelains.
13. Body preparation of Table wares / art wares /sanitary wares and glazing
14. Body preparation of floor tiles/wall tiles.
15. Pattern making using plaster of Paris and mould preparation.
16. Analysis of alkalies by flame photometer.
17. Particle size analysis of clay by sedimentation.
18. Viscosity measurement of low melting point glazes by Littletons method.
19. Rheological properties of clay based slips
20. Effect of Milling time on particle size of ceramic body.
21. Determination of drying shrinkage of the bodies.
22. Determination of LOI of different clays.
23. Determination of Adsorbed moisture in clays.

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BTCT- 0404 ENGINEERING THERMODYNAMICS

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0404	ENGINEERING THERMODYNAMICS	3	1	2	6	80	26	20	100	50	17	50	100	200	3hrs

Objectives

To enable the students to have a basic knowledge of thermodynamics and applications of thermodynamic laws to various systems.

Outcome

Have an understanding about the basic concepts of thermodynamics and thermodynamic laws, have an idea of behavior of gases, have learnt various applications of thermodynamics and handle thermodynamic problems, have an understanding of thermodynamics of pure fluids, have a basic understanding of reaction equilibria.

UNIT- 1 MARKS: 16

Basic concepts: System, surroundings and processes, closed and open systems, state and properties, intensive and extensive properties, state and path functions, equilibrium state and phase rule, zeroth law of thermodynamics, heat reservoir and heat engines, reversible and irreversible processes.

UNIT- 2 MARKS: 16

First law of thermodynamics: General statement, first law for cyclic and non-flow processes, heat capacity. PVT behavior: PVT behavior of pure fluids, equations of state and ideal gas law, processes involving ideal gas law: constant volume, constant pressure, constant temperature, adiabatic and polytropic processes. Equations of state for real gasses. Compressibility charts, principles of corresponding states, generalized compressibility charts.

UNIT- 3 MARKS: 16

Heat effects accompanying chemical reactions: Standard heat of reaction, formation, combustion, Hess's law of constant heat summation, effect of temperature on standard heat of reaction.

UNIT- 4 MARKS: 16

Second law of thermodynamics: General statement of the second law, concept of entropy, the carnot principle, calculation of entropy changes, clausisus inequality, entropy and irrerversiblity, third law of thermodynamics.

UNIT- 5 **MARKS: 16**

Second law of thermodynamics: General statement of the second law, concept of entropy, the carnot principle, calculation of entropy changes, clausisus inequality, entropy and irrerversiblity, third law of thermodynamics. Chemical reaction equilibrium: Reaction stoichiometry, criteria of chemical reaction equilibrium, equilibrium constant and standard free energy change, effect of temperature, pressure on equilibrium constants and other factors affecting equilibrium conversion.

Recommended Books:

1. Introduction to Chemical Engineering Thermodynamics – Smith J.M., and Van Ness H.C., 5th ed., McGraw Hill, NY, 1996.
2. Chemical Engineering Thermodynamics – Y.V.C. Rao, New Age Intl. Pub., Nagpur
3. Textbook of Chemical Engineering Thermodynamics – K.V. Narayanan, Prentice Hall of India Pvt. Ltd., New Delhi, 2001.

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BTCT- 0405 HEAT TRANSFER

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0405	HEAT TRANSFER	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

Objectives:

To enable students to understand heat transfer and laws of heat transfer, heat transfer equipment

Outcome:

Have learnt about modes of heat transfer and laws, heat transfer in extended surfaces, boiling and condensation phenomena, heat exchangers and evaporators.

UNIT- 1 MARKS: 16

Introduction: Modes of heat transfer – conduction, convection and radiation. Conduction: Fourier's law, steady state unidirectional heat flow through single and multiple layer slabs, cylinders and spheres. Insulation: Properties of insulation materials, types of insulation. critical and optimum thickness of insulation.

UNIT- 2 MARKS: 16

Extended surfaces: Fins – types, derivation of fin efficiency for longitudinal fins, fin effectiveness. Elementary treatment of unsteady state heat conduction. Convection: Individual and overall heat transfer coefficient, LMTD, LMTD correction factor. Dimensional analysis, empirical correlation for forced and natural convection. Analogy between momentum and heat transfer – Reynolds, colburn and Prandtl analogies.

UNIT- 3 MARKS: 16

Heat transfer with phase change: Boiling phenomena, nucleate and film boiling. Condensation – film type and drop wise condensation, Nusselt equations. Heat transfer equipment: Double pipe heat exchangers, shell and tube heat exchangers, types of shell and tube heat exchangers, constructional details. Condenser – types of condensers.

UNIT- 4 MARKS: 16

Evaporators: Types of evaporators, performance of tubular evaporator – evaporator capacity and economy, multiple effect evaporator, methods of feeding, effect of liquid head and boiling point elevation. Vapor recompression evaporation.

UNIT- 5 **MARKS: 16**

Radiation: Absorptivity, reflectivity, emissive power and intensity of radiation. Black body radiation, Gray body. Stefan – Boltzmann law, Wien's displacement law, Kirchoffs law.

Recommended Books:

1.McCabe W.L., et. al., "UNIT- Operations of Chemical Engineering", 5th ed., McGraw Hill International, Singapore, 2000.

2.Coulson J.M. and Richardson J.F., "Chemical Engineering" Vol 1, 5th ed., Pergamon Press.
3.Kern D.Q., "Process Heat Transfer", McGraw Hill, New York, 1965.
4.Rao Y.V.C., "Heat Transfer", Universities Press (I) Ltd., New Delhi, 2001.

LIST OF EXPERIMENTS:

1. Calibration of thermocouple
2. Thermal conductivity of metal rod
3. Conduction through composite wall
4. Natural convection
5. Forced convection
6. Double pipe heat exchanger
7. Pin fins
8. Lagged pipe
9. Emissivity study
10. Determination of Stefan – Boltzman constant
11. Determination of critical heat flux in boiling

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BTCT- 0406 Computer Programming -II

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0406	Computer Programming -II	-	-	2	2	-	-	-	-	50	15	50	100	100	3hrs

UNIT- 1 **MARKS: 16**

Introduction .NET framework, features of .Net framework, architecture and component of .Net, elements of .Net.

UNIT- 2 **MARKS: 16**

Basic Features Of C# Fundamentals, Classes and Objects, Inheritance and Polymorphism, Operator Overloading, Structures. Advanced Features Of C# Interfaces, Arrays, Indexers and Collections; Strings and Regular Expressions, Handling Exceptions, Delegates and Events.

UNIT- 3 **MARKS: 16**

Installing ASP.NET framework, overview of the ASP .net framework, overview of CLR, class library, overview of ASP.net control, understanding HTML controls, study of standard controls, validations controls, rich controls, Windows Forms: All about windows form, MDI form, creating windows applications, adding controls to forms, handling Events, and using various Tolls.

UNIT- 4 **MARKS: 16**

Understanding and handling controls events, ADO.NET- Component object model, ODBC, OLEDB, and SQL connected mode, disconnected mode, dataset, data-reader Data base controls: Overview of data access data control, using grid view controls, using details view and frame view controls, ado .net data readers, SQL data source control, object data source control, site map data source.

UNIT- 5 **MARKS: 16**

XML: Introducing XML, Structure, and syntax of XML, document type definition (DTD), XML Schema, Document object model, Presenting and Handling XML. xml data source, using navigation controls, introduction of web parts, using java script, Web Services.

Recommended Books:

1.C# for Programmers by Harvey Deitel, Paul Deitel, Pearson Education
2.Balagurusamy; Programming in C#; TMH
3.Web Commerce Technology Handbook by Daniel Minoli, Emma Minoli , TMH
4.Web Programming by Chris Bates, Wiley
5.XML Bible by Elliotte Rusty Harold ,
6.ASP .Net Complete Reference by McDonald, TMH.
7.ADO .Net Complete Reference by Odey, TMH

List of Experiments/ program (Expandable):

1. Working with call backs and delegates in C#
2. Code access security with C#.
3. Creating a COM+ component with C#.
4. Creating a Windows Service with C#
5. Interacting with a Windows Service with C#
6. Using Reflection in C#
7. Sending Mail and SMTP Mail and C#
8. Perform String Manipulation with the String Builder and String Classes and C#:
9. Using the System .Net Web Client to Retrieve or Upload Data with C#

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Semester-V

BTCT-0501CEMENT TECHNOLOGY – I

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-501	CEMENT TECHNOLOGY – I	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

UNIT-1 **MARKS:16**

Origin and development of cement industries, lime and other building materials, different classes of building lime and their properties, Classification of cement. Raw materials, their selection and proportioning, calcareous and argillaceous materials, quality requirements, corrective materials and additives, industrial waste and by-products, Study of phase diagrams of binary, ternary i.e. CaO-Al2O3-SiO2 and phase relations of the clinker material,

UNIT- 2 **MARKS:16**

Proportion of different phase constituents and their ultimate effect on properties of cement, significance of moduli value of HM, SM, AM, LSF etc., Guidelines for selection of raw materials for different processes, Raw materials quality and burnability factors for clinkerisaton, effect of minor constituents and mineralizers on raw mix burning and cement characteristics.

UNIT-3 **MARKS:16**

Thermo-chemistry of clinker formation, sequence of reaction, reaction products, calculation of potential phase composition and liquid phase temperature, Hydration of Portland cement – hydration mechanisms and related theories for C3S phase and mechanisms of C2S and C3A, Setting and hardening of Portland cement, set regulations for gypsum, physical and mechanical properties of Portland cement.

UNIT-4 **MARKS:16**

Types of cements and their use: quick setting cement, rapid hardening cement, low heat cement, blast furnace slag cement, pozzolona and pozzolonic cement, high alumina cement, sorrel cement, hydrophobic cement, water proof cement, expanding and stressing cement, sulfate resisting cement, super-sulphate cement, trief cement.

UNIT-5 **MARKS:16**

Testing of cement – particle size analysis by different methods, initial and final setting time, density of cement, soundness of cement, strength test etc., ISI specifications for different types of cement. Gypsum and plaster of Paris, manufacture of plaster of Paris and its uses.

Recommended Books:

1.Text book of Cement and Concretes - Lee F.M.
2.Advances in Cement technology – S.N. Ghosh, ABI Books Pvt. Ltd., New Delhi.
3.Cement Engineer's Handbook – Von Otto Labahn, McGraw Hill.
4.Cement – Banerjee
5.Cement – Chatterjee

List of experiments:

1. Determination of particle size distribution in cement by sieve analysis
2. Determination of surface area of cement by air permeability
3. Determination of particle size distribution in cement by sedimentation
4. Determination of consistency of cement
5. Determination of initial setting time of cement
6. Determination of final setting time of cement
7. Determination of soundness of cement
8. Determination of compressive strength of cement
9. Technical analysis of cement by flame photometer
10. Estimation of iron content in cement by spectrophotometer
11. Chemical analysis of cement
12. Determination of flexural strength of cement mortar
13. Determination of heat of hydration of cement
14. Hydrophobicity of cement
15. Determination of water of absorption of cement (low pressure perm. Test)
16. Preparation of special cement
17. Effect of clinker milling time on fineness of cement

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BTCT-0502 STRUCTURE & PROPERTIES OF MATERIALS

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0502	Structure & Properties Of Materials	3	1	-	4	80	25	20	100	-	-	-	-	100	3hrs

UNIT- 1 **MARKS:16**

Classification of materials, interatomic bonds, ionic bonds, covalent bonds, vander waals bonds, metallic bonds, intermediate bonds, Ionic crystals, covalent crystals and metal crystals, Geometry of crystals and Bravais lattices, grouping of ions and Pauling's rule.

UNIT- 2 **MARKS:16**

Primary ceramic structures: Rock salt structure with examples, wurtzite structure with examples, zinc blende structure, spinel structure with examples, corundum structure, rutile structure, cesium chloride structure, fluorite structure, anti-fluorite structure, perovskite structure, illmenite structure.

UNIT- 3 **MARKS:16**

Derivative structure, common features of oxide structure, silicate structure: orthosilicates, pyrosilicates, metalsilicates, frame work structure and its derivative structures, clay minerals. Other ceramic structures: Gibbsite, Graphite, carbides and nitrides.

UNIT- 4 **MARKS:16**

Polymorphism: Polytypism, thermodynamic relations, structural characteristics of transformations, displacive transformation, reconstructive transformation, polymorphic forms of silica, Polymers: Classification of polymers, molecular weight, molecular shape, molecular structures, linear polymers, branched polymers, cross linked polymers, network polymers.Common polymers: Polyethylene, polymethyl metha acrylate, PVC, polyvinyl alcohol, polyvinyl butyral, polyethylene glycol, Binders for ceramics: Desirable characteristics of binders, common binder choices, plasticizers, wetting agents, lubricants, Metals: Factors affecting structure of solids, structure of some important pure metals: aluminium, cobalt, copper, iron, magnesium, nickel, and zinc.

UNIT-5 **MARKS:16**

Composites: Classification, application and examples of ceramic based, metal based and polymer based composites.

Recommended Books:

1.Introduction to ceramics – W.D. Kingery
2.A text book of material science and metallurgy – O.P. Khanna
3.Material science and engineering: An introduction – W.D. Callister
4.Introduction to material science for engineers – J.F. Shackelford
5.Elements of material science and engineering – L.H. Van Vlack
6.Introduction to principles of ceramic processing – James Reed
7.Engineering materials: Properties and selection – Kenneth Budinski
8.Organic additives and ceramic processing – D.J. Shanefield
9.Advanced ceramics – P. Ramakrishnan
10. Structure and properties of engineering materials – V.S.R. Murthy, A.K. Jena
11. Materials Technology – Hajra & Chowdhary

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BTCT-0503 INSTRUMENTAL METHODS OF ANALYSIS

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0503	INSTRUMENTAL METHODS OF ANALYSIS	3	1	-	4	80	25	20	100	-	-	-	-	100	3hrs

UNIT- 1 **MARKS:16**

Principles, working and applications of UV-VIS spectrophotometer and flame photometer

UNIT-2 **MARKS:16**

Principles, instrumentation, working and applications of Atomic absorption spectrophotometer and Refractrometer

UNIT-3 **MARKS:16**

Principles and applications of potentiometry, pH metry, titrimetry and ion selective electrodes, conductometry, Principles and applications of electrogravimetry and polarography

UNIT- 4 **MARKS:16**

Principles, instrumentation, working and applications of TGA, DTA and DSC, Principles and applications of column, TLC and paper chromatography

UNIT- 5 **MARKS:16**

Principles, instrumentation, working and applications of Gas chromatography, Principles, instrumentation, working and applications of XRD and SEM.

Recommended Books:

1.Instrumental Methods of Chemical Analysis – G.R. Chatwal & S.K. Anand.
2.Instrumental Methods of Analysis – H.H. Willard et al.
3.Instrumental Methods of Chemical Analysis – Galen W. Ewing.

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BTCT-0504 ENGINEERING METALLURGY

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0504	ENGINEERING METALLURGY	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

UNIT-1 **MARKS:16**

INDUSTRIAL MELTING OF METALS AND ALLOYS: Furnaces used for melting, melting of cast iron, aluminum alloys and copper-base alloys.

INGOT CASTING: Casting steel ingots, casting non-ferrous metals, continuous casting, zone refining. Sand casting: Basic steps, patterns and their design, moulding materials, CO2 process. DIE-CASTING: Methods die steels, die-casting alloys, permanent mould casting.

OTHER CASTING PROCESSES: Centrifugal casting, shell moulding, investment casing, 'Mercast' process, and full mould process.

UNIT-2 **MARKS:16**

POWDER METALLURGY:

Manufacture of cemented carbides, production of metal powders, powder mixing, bonding and coherence of metal powders, compacting, sintering, sizing and impregnation, rolling and extrusion of powders, advantages and limitations of the process, applications of powder metallurgy.

UNIT-3 **MARKS:16**

ROLLING OF METALS: Types of rolling mill, tube making process involving rolling operations, applications of transverse rolling.Forging processes: Types of forging hammer and press, smith forging, closeddie forging, high-energy rate forging, upset forging, cold heading.

UNIT-4 **MARKS:16**

EXTRUSION

Direct and indirect methods, hydrostatic extrusion, extrusion of tubes, extrusion forging, impact extrusion. Drawing: Rod, wire and tube drawing. Deep-drawing, re-drawing, marforming and hydro-forming.

UNIT-5 **MARKS:16**

HEAT TREATMENT OF STEEL

Furnaces used, quenching operations, gas carburizing. Heat treatment of non-ferrous metals and alloys, Pressure welding, soldering and brazing, arc welding.

Recommended Books:

1.A Textbook of Material Science and Metallurgy – O.P. Khanna, Dhanpat Rai Pub. (P) Ltd., 1999.
2.Engineering Metallurgy (Part 2: Metallurgical Process Technology) – Raymond A. Higgins, 2nd Ed., LBS, 1974.
3.Mechanical Metallurgy – George Dieter, 3rd Ed., McGraw Hill, 1986.

LIST OF EXPERIMENTS:

1. Effect of milling time on particle size of grog.
2. Effect of milling time on particle size of clinker.
3. Estimation of energy requirement for clinker grinding.
4. Effect of De-flocculent on viscosity of whitewares slip.
5. Effect of milling on viscosity of slip.
6. Preparation of shear amorphous solids by milling.
7. Preparation of plaster of paris moulds.
8. Slip casting of white wares bodies.

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BTCT-0505 PROCESS CALCULATIONS

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0505	PROCESS CALCULATIONS	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

UNIT-1 **MARKS:16**

Fundamental and derived UNIT-, conversion, dimensional consistency of equations, dimensionless groups and constants, conversion of equations, Concept of mole, mole fraction, compositions of mixtures of solids, liquids and gases. Concept of normality, molarity, molality, ppm. Use of semilog, log-log, triangular graphs. Ideal gas law calculations.

UNIT-2 **MARKS:16**

Material balance without reaction: General material balance equation for steady and unsteady state, typical steady state material balances in distillation, absorption, extraction, crystallization, psychrometry (without use of humidity chart), drying, mixing and evaporation, Material balances involving bypass, recycle and purging.

UNIT-3 **MARKS:16**

Steady state material balance with reaction: Principles of stoichiometry, concept of limiting, excess reactants and inerts, fractional and percentage conversion, fractional yield and percentage yield, selectivity, related problems.

UNIT-4 **MARKS:16**

Proximate and ultimate analysis of fuels, Calculations involving burning of solid, liquid and gaseous fuels, excess air, air-fuel ratio calculations, Energy balance: General steady state energy balance equation. Thermo physics, thermo chemistry and laws, heat capacity, enthalpy, heat of formation, heat of reaction, heat of combustion and calorific values.

UNIT-5 **MARKS:16**

Energy balance (continued): Heat of solution, heat of mixing, heat of crystallization, determination of enthalpy of reaction at standard and elevated temperatures. Theoretical and adiabatic flame temperature

Recommended Books:

1.Bhatt, B.I., and Vora, S. M., “Stoichiometry (SI UNIT-s)”, Third edition, 1996, Tata McGraw Hill Publishing Ltd., New Delhi.
2.Hougen O.A., Watson K.M. and Ragatz R.A., “Chemical Process Principles (Part I)
3.“Material and Energy balances”, Second edition, CBS Publishers and distributors, New Delhi, 1995.
Himmelblau D.M., “Basic Principles and Calculations in Chemical Engineering”, 6th ed., Prentice Hall of India, New Delhi, 1997.

LIST OF EXPERIMENTS

1. Application of glazes on white ware bodies.
.2 Decoration of white ware bodies.
.3 Tile pressing and firing.
4Jiggering and jolleying operation to fabricate tablewares and potteries.
5Preparation of insulating refractory brick.
.6 Preparation and testing of glass fibers.

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Semester-VI

BTCT-0601CEMENT TECHNOLOGY – II

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0601	CEMENT TECHNOLOGY – II	3	1	-	4	80	25	20	100	50	15	50	100	200	3hrs

UNIT-1 **MARKS:16**

Crushing of raw materials, open and closed circuit crushing, construction and working features of different types of crushers, drying – grinding, energy consumption, laws of size reduction and its applications, Types of air separators, pre-homogenization, blending and homogenizing of raw mixes in wet and dry processes

UNIT-2 **MARKS:16**

Clinkerization, rotary kiln design and constructional features, types of refractories applied, installation of refractories, recent advances in cement industries, Principles of operations of preheaters and their structural features, principles of pre-calcination, advantages of pre-calcination, different types of pre-calcinator systems, and their applications.

UNIT-3 **MARKS:16**

Kiln burning: types of burners used for gas, oil and coal fuels, improved burners for coal firing, firing system for coal, Control of primary and secondary air flow rate and temperature, control of flame shapes and length, excess and false air and their effect on fuel consumption, hard and soft burning, process parameters affecting kiln performance and clinker quality. Burning techniques. Instruments for control of kiln operation

UNIT-4 **MARKS:16**

Clinker coolers: needs of clinker cooling, various types of coolers, effect of cooling on the characteristics of clinker, Grinding of cement: Equipment used, control of fineness, external and internal water cooling of cement grinding media, Dust collection systems: principle of operation, design and constructional features of dust collectors.

UNIT-5 **MARKS:16**

Material handling equipment: elementary idea regarding material handling equipment used in cement industry, Storage practice in cement plants.

Recommended Books:

1.Cement data book – Vol.I, II, III – W.H. Duda, Gmbh Germany.
2. The rotary cement kiln – K.E. Perry, J.J. Wadell, Chemical Public. Co., N.Y. 1972.
3.Process technology of cement manufacture – Bauverlag, Gmbh Germany.
4.Cement Engineer's Handbook – Von Ottolabahn, McGraw Hill, N.Y.
5.Cement – Perry

List of experiments:

1. Determination of particle size distribution in cement by sieve analysis
2. Determination of surface area of cement by air permeability
3. Determination of particle size distribution in cement by sedimentation
4. Determination of consistency of cement
5. Determination of initial setting time of cement
6. Determination of final setting time of cement
7. Determination of soundness of cement
8. Determination of compressive strength of cement
9. Technical analysis of cement by flame photometer
10. Estimation of iron content in cement by spectrophotometer
11. Chemical analysis of cement
12. Determination of flexural strength of cement mortar
13. Determination of heat of hydration of cement
14. Hydrophobicity of cement
15. Determination of water of absorption of cement (low pressure perm. Test)
16. Preparation of special cement
17. Effect of clinker milling time on fineness of cement

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BTCT- 0602 REFRACTORIES – I

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0602	REFRACTORIES – I	3	1	-	4	80	25	20	100	50	15	50	100	200	3hrs

UNIT-1 **MARKS:16**

Definition, Classification, raw materials, scope of refractory industries in India, Review of raw materials for different refractories and their methods of winning and handling

UNIT-2 **MARKS:16**

Drying shrinkage, processing variables for controlling drying shrinkage, drying in hot floors and other types of dryers

UNIT-3 **MARKS:16**

Detailed knowledge of the manufacture of Alumno-silicate bricks, silica and semi silica, magnesite, dolomite, chrome and chrome magnesite, insulation bricks, oxide refractories, carbon and graphitized refractories, Mag-carbon refractories, borides, carbides and nitrides, fusion cast
refractories.

UNIT-4 **MARKS:16**

Specification of different kinds of bricks, PCE tests, compression, torsional and creep properties. RUL test, reheat shrinkage, spalling resistance, slag resistance, reaction between refractories and glasses

UNIT-5 **MARKS:16**

Heat transmission, behavior of refractories in different environment, carbon monoxide disintegration.

Recommended Books:

1.Refractories – Nandi
2.Refractories - Rashid Chesti
3.Refractories – F.H. Norton
4.Refractories: Properties & application – J.H. Chesters.
5.Refractories – M.L. Mishra
6.Refractories Properties & application – Kenneth Shaw

LIST OF EXPERIMENTS:

1. Preparation of Refractory Samples.
2. Estimation of SiO_2, Al_2O_3, Cr_2O_3,Fe_2O_3,TiO_2,CaO,MgO,Na_2O in refractory material.
3. Determination of Porosity in Refractory material.
4. Determination of Bulk density
5. Determination of true / apparent specific gravity
6. Determination of drying shrinkage of refractory material.
7. Determination of firing shrinkage of refractory material.
8. Determination of Cold Crushing Strength of refractory material.
9. Determination of R.U.L. of refractory material.
10. Determination of Thermal Expansion of refractory material.
11. Determination of Refractoriness (PCE) of refractory material.
12. Determination of Thermal Spalling Resistance of refractory material.
13. Determination of Thermal conductivity of refractory material.
14. Determination of Modulus of Rupture of refractory material.
15. Determination of Reversible Thermal Expansion of refractory material.
16. Determination of Creep Resistance of refractory material.
17. Determination of carbon-monoxide disintegration test for refractory material.
18. Determination of loss on ignition.
19. Determination of adsorbed moisture.
20. Determination of chemically combined water.

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BTCT- 0603 MATERIALS TECHNOLOGY

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0603	MATERIALS TECHNOLOGY	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

UNIT-1 **MARKS:16**

Physical Metallurgy: Micro and Macro structures, thermal, chemical, electrical and magnetic properties, Extractive metallurgy: Production of cast iron, mild steel, stain less steel, special steels with special reference to metallurgical furnaces and fundamentals of foundry technology.

UNIT-2 **MARKS:16**

Study of properties and application of following materials: Ferrous metals: Pure iron, cast iron, mild steel, stainless steel, special steels.

UNIT-3 **MARKS:16**

Study of properties and application of following materials: Non-ferrous metals: Copper and its alloys, aluminum and its alloys, nickel, cobalt and chromium, zinc and lead.

UNIT-4 **MARKS:16**

Study of properties and application of following materials: Polymers: Structural features of polymers, thermosetting and thermoplastic polymers with examples, Study of properties and application of following materials: Ceramic-Ceramic, Ceramic-Metal, Metal-Metal, Ceramic-Polymer, Metal-Polymer composites

UNIT-5 **MARKS:16**

Coatings: Organic paints and coatings, metal coatings ceramic coatings. Selection of materials: General criteria of selection, scientific factors to be considered for selection of material of engineering, architecture and bio-medical applications

Recommended Books:

1.Fundamentals of physical metallurgy - John D. Verhoeven, John Wiely & Sons.
2.High Temperature Oxides - Ceramic Engg. Monograms.
3.Metals hand book - HMSO.
4.Introduction to materials for Engineers – Shackleford, Macmillian Publishing Co., New York.

LIST OF EXPERIMENTS:

1. Chemical analysis of cement
2 Determination of flexural strength of cement mortar
3. Determination of heat of hydration of cement
4. Hydrophobicity of cement
5. Determination of water of absorption of cement (low pressure perm. Test)
6. Preparation of special cement

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BTCT-0604 PROCESS PLANT UTILITIES

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0604	PROCESS PLANT UTILITIES	3	1	-	4	80	25	20	100	-	-	-	-	100	3hrs

UNIT-1 **MARKS:16**

Water: Sources of water, requisite of industrial water, hard and soft water, methods of water treatment, cooling towers, raw water treatment, Steam: Properties, steam generating plant, boiler mountings, boiler accessories, Indian Boiler Act, 1923.

UNIT-2 **MARKS:16**

Refrigeration: Carnot, air-refrigeration, vapor-compression cycles, choice of refrigerant, absorption refrigeration, brine, Air: Introduction, compressed air, blower air, fan air, making safe compressed respiratory air, system for drying, instrument air. Industrial

Fuels: Fuel classification and calorific values of fuels.

UNIT- 3 **MARKS:16**

Furnaces: Introduction, classification of furnaces, parts of furnaces. Refractories: Properties of refractories, manufacture of refractories, types of refractories and their utility, Insulation: Introduction, characteristics of an ideal thermal insulator, classification, glass wool, thermocole, cold insulation, low temperature insulation.

UNIT- 4 **MARKS:16**

Electricity: Plant electrical system – Preliminary load study, onsite power generation, main plant sub-station, circuit options, electrical distribution systems, selection of voltage levels, distribution system design. Electrical system and its protection, protection of instrumentation, plant safety, energy conservation, Standby power (SP), uninterrupted power supply (UPS).

UNIT- 5 **MARKS:16**

Pressure / vacuum creating systems: Introduction, compression / pressurization of gases, fans, centrifugal and axial compressors, rotary blowers and compressor, reciprocating compressor, ejectors, vacuum system, sealing rotating shaft.

Recommended Books:

1. A Textbook of Plant Utilities – Dr. B.A. Mujawar, Nirali Prakashan Publication, 3rd Ed., 1997.
2. Kaingery et al-Introduction to Ceramics – W.D. Kingery, John Wiley & Sons, 1976
3. Fundamentals of Ceramics – Barsoum
4. Materials science and Engineering – Van Vlack
5. Materials Science and Engineering – V. Raghvan, Prentice Hall of India Pvt. Ltd.
6. Matererial Engineering – William D. Callister

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BTCT- 0605 MECHANICAL & THERMAL BEHAVIOUR OF MATERIALS

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0605	MECHANICAL & THERMAL BEHAVIOUR OF MATERIALS	3	1	-	6	80	25	20	100	-	-	-	-	100	3hrs

UNIT- 1 **MARKS:16**

Physical properties- density, crystallographic density, bulk density, theoretical density, specific gravity, open porosity, density measurements, porosity measurements.

UNIT- 2 **MARKS:16**

Mechanical behavior-Elasticity, modulus of elasticity, elastic modulus measurement, strength, theoretical strength, effect of flaw size, pore shape, pore crack combinations, internal pores, pore clusters, inclusions. Strength measurement-Tensile strength, compressive strength, bends strength, biaxial strength, fracture toughness, ductile fracture, brittle fracture, Griffith criteria, hardness, Moh's scale, and indentation techniques.

UNIT- 3 **MARKS:16**

Ductile versus brittle behavior, mechanism of plastic deformation, deformation behavior of metals, deformation behavior in ceramics, single crystal, polycrystalline ceramics, elementary idea about mechanical behavior of composites, Viscous deformation in inorganic glasses. Major mechanical properties of polymers-Viscoelastic deformation, elastomers, stress relaxation.

UNIT- 4 **MARKS:16**

Thermal behavior-melting behavior, heat capacity, thermal conductivity, thermal expansion of metals, ceramics, inorganic glasses and organic solids, importance of thermal expansion, Thermal stresses-due to thermal expansion, due to thermal gradients, resistance to thermal shock and spalling, thermal strengthening, annealing, chemical strengthening. Shot peening. Time, temperature and environmental effects- creep, single crystal creep,

UNIT- 5 **MARKS:16**

Polycrystalline creep, creep in non-crystalline solids, effects of composition, stoichiometry and environment. Static fatigue, chemical effects, gas-solid reactions, reduction and other reactions, interactions with water vapor, liquid

solid reactions, low and high temperature corrosion, condensed phase corrosion, corrosion in coal combustion environment, mechanically induced effects.

Recommended Books:

1.Modern Ceramic engineering – D.W. Richerson, Marcel-Dekker Inc. 1992
2.Introduction to Materials Science for Engineers – James F. Schakelford, Macmillan publishing Co., 1985
3.Kingery et al-Introduction to Ceramics – W.D. Kingery, John Wiley & Sons, 1976
4.Fundamentals of Ceramics – Barsoum
5.Materials science and Engineering – Van Vlack
6.Materials Science and Engineering – V. Raghvan, Prentice Hall of India Pvt. Ltd.
7.Matererial Engineering – William D. Callister

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Semester-VII

BTCT-0701 ENTREPRENEURSHIP & MANAGERIAL ACCOUNTING

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0701	ENTREPRENEURSHIP & MANAGERIAL ACCOUNTING	3	1	-	4	80	25	20	100	0	0	0	0	100	3hrs

UNIT-I **MARKS: 16**

ENTREPRENEUR

Meaning of Entrepreneur; Functions of an Entrepreneur, Types of Entrepreneur, Entrepreneur - an emerging Class, Concept of Entrepreneurship, Role of entrepreneurs in Economic, Development; Entrepreneurship in India; Entrepreneurship – its Barriers, SMALL SCALE INDUSTRY: Definition; Characteristics; Need and rationale: Objectives; Scope; role of SSI in Economic Development, Advantages of SSI Steps to start an SSI ; Impact of Liberalization, Privatization, Globalization on S.S.I., Effect of WTO/GATT.

UNIT-II **MARKS: 16**

INSTITUTIONAL SUPPORT: Need for Institutional support; NSIC, SIDO, SSIB, SSICS, SISI, DICs, TCOs.

PREPARATION OF PROJECT: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation.

UNIT-–III **MARKS: 16**

Fundamentals of Financial Accounting: Definition, Scope and Functions of Accounting, Accounting concepts & conventions, Double entry system – Journal, Journalizing. Ledger, Trial Balance, Trading and Profit & Loss Account, Balance Sheet. Problems Sources of Finance, Shares ;Equity, Preference, Debt Capital, Financial Institutions – Cost of Various sources of financing – concept of capital structure. (Simple description)

UNIT-IV **MARKS: 16**

Ratio analysis – Meaning – Standards of Comparison. Profitability Ratios – G.P. Ratio, N.P. Ratio, ROI, EPS, P/E Ratio, Liquidity Ratios – current Ratio, Quick Ratio, Solvency Ratios – Debt equity, Debt – Total funds, Turnover

Ratios – Stock Turnover, Debt Turnover, Stock velocity, Debt collection period, Fixed assets turnover, working capital turnover, Simple problems on Ratio analysis.

UNIT-V **MARKS: 16**

Cost Accounting: Meaning – Nature and scope of Cost Accounting, Costs – Meaning - Classification : Costing methods- Process and Product , Overheads – Cost Allocation and apportionment, Marginal Costing – Meaning – Marginal cost Statement, Break even Analysis – P/V Ratio, BEP.

SUGGESTED READINGS:

1. Financial Accounting – B S Raman – UNIT-ed Publishers, Mangalore
2. Maheswar SN and Maheswari S.K., Finanical Accounting, Vikas Publishing House, Mumbai
3. Pandey I.M., Financial Management, Vikas Publishing House, Mumbai.
4. Khan M. Y and Jain P.K., Financial Management, TMH, New Delhi
5. Maheshwari S.N, Cost and Management Accounting, Vikas Publishing House, Mumbai
6. Jain P.K. and Naraang K.L., Cost Accounting, kalyani Publishers, Mumbai
7. Cost Accounting – Pattanshetti & Palekar – S Chand & Co. Delhi, New Delhi:
8. Entrepreneurial Development – Dr. S. S. Khanka S.Chand & Company Ltd. New Delhi.
9. Dynamics of Entrepreneurial Development & Management - Vasant Desai -Himalaya Publishing House.
10. Entrepreneurship Development - Small Business Enterprises - Poornima M Charantimath - Pearson Education – 2006.

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BTCT-0702 REFRACTORIES – II

Course name	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0702	REFRACTORIES – II	3	1	-	4	80	25	20	100	50	15	50	100	200	3hrs

UNIT- I **MARKS:16**

Sintering: Introduction, definition, types of sintering processes, study of driving force, mechanisms, Modes of material transport, topology of solid state sintering, liquid phase sintering and vapor phase sintering, parameters for control of sintering processes, Physical properties of Oxide ceramic materials, Refractory carbides, nitrides, cermets and composite materials.

UNIT- 2 **MARKS:16**

High temperature oxide ceramics – magnesia, alumina, zirconia, titania, urania and beryllia, Phase diagrams related to the manufacture of conventional refractory one, two and three-component systems for refractory manufacturing.

UNIT- 3 **MARKS:16**

Heat setting and air setting bonding mortar, ramming masses, castables, gunning material, gunning tar mixes, properties of refractories based on microstructure, and of conventional refractories.

UNIT- 4 **MARKS:16**

Blast furnace, design and installation of blast furnace, carbon lining, modification of hot blast for high temperature operation. Basic and acidic open hearth furnaces, soaking pits, reheating furnaces, hot metal mixer, ladles, steel melting furnaces by electricity. Application of refractories, for secondary steel making process, continuous casting, VOD and other new process of steel making.

UNIT- 5 **MARKS:16**

Refractories in non-ferrous industries, refractories in generation of steam, power, nuclear power production, furnaces used in glass, cokeovens, cement industries, gas production, Chemical and Non-ferrous industries.

Recommended Books:

1. Refractories - F.H. Norton
2. Refractories: Properties & application - J.H. Chester
3. Refractories - Kenneth Shaw

4. Monolithic Refractories - W.D. Kingery
5. Refractories - M. L. Mishra
6. Introduction to Ceramics - W. D. Kingery

LIST OF EXPERIMENTS:

1. Preparation of Refractory Samples.
2. Estimation of SiO_2, Al_2O_3, Cr_2O_3,Fe_2O_3,TiO_2,CaO,MgO,Na_2O in refractory material.
3. Determination of Porosity in Refractory material.
4. Determination of Bulk density
5. Determination of true / apparent specific gravity
6. Determination of drying shrinkage of refractory material.
7. Determination of firing shrinkage of refractory material.
8. Determination of Cold Crushing Strength of refractory material.
9. Determination of R.U.L. of refractory material.
10. Determination of Thermal Expansion of refractory material.

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BTCT-0703 PROCESS CONTROL

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0703	PROCESS CONTROL	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

UNIT-1 **MARKS:16**

BASIC CONCEPTS OF PROCESS CONTROL

Laplace transform of simple functions, transforms of derivatives, solution of differential equations, inversion by partial fractions.

UNIT2 **MARKS:16**

Response of first-order systems, physical examples of first-order systems, response of first-order systems in series, higher order systems: Second-order and transportation lag.

UNIT-3 **MARKS:16**

LINEAR CLOSED LOOP SYSTEMS

Control system, controllers and final control elements, block diagram of a chemical reactor control system, closed-loop transfer functions, transient response of simple control systems, Root locus.

UNIT-4 **MARKS:16**

STABILITY, FREQUENCY RESPONSE ANALYSES AND DESIGN

Stability: characteristic equation, Routh-Hurwitz criterion, Root-Locus analysis.

UNIT-5 **MARKS:16**

Frequency response analysis of linear processes, Bode stability criterion, gain and phase margins

Recommended Books:

1. Coughanour D.R., Process system Analysis & Control, 2nd Edn., McGraw Hill, Singapore, 1991
2. Peter Harriott, Process Control, McGraw Hill, New York, 1972
3. George Stephenopoulous, Chemical Process Control, 1st Edn., Prentice Hall of India, New Delhi, 1998

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List of experiments (expandable)

1. To study all inversions of four-bar mechanisms using models
\2. Draw velocity and acceleration polygons of all moving link joints in slider crank mechanism
\3. Determination of velocity and acceleration in above using method of graphical differentiation
\4Grading IVth Semester w.e.f.2011-12
5. To study working of differential gear mechanism.
5. To study working of sun and planet epicycle gear train mechanism using models

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BTCT-0704 Mechanical Measurement & Control

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0704	Mechanical Measurement & Control	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

Unit I MARKS-16

Basic Concepts of Measurement: General measurement system; Experimental test plan: variables, parameters, noise and interference, replication and repetition; Calibration: Static calibration, dynamic calibration, static sensitivity, range, accuracy, precision and bias errors,sequential and random tests; Presenting data: Rectangular coordinate format, semi-log, full-logformats. Measurement System Behavior: General model for a dynamic measurement systemand its special cases: zero order, first order, and second order system, determination of timeconstant and settling time, phase linearity.

Unit II MARKS-16

Statistics: Least square regression analysis and data outlier detection; Normal distribution and concept of standard deviation of the mean in finite data set, Uncertainty Analysis: Measurement errors; error sources: calibration, data acquisition, data reduction; Design stage uncertainty analysis; combining elemental errors; Bias & Precision errors; Errorpropagation, Higher order uncertainty analysis.

Unit III MARKS-16

Temperature Measurement: Temperature standards, Temperature scales;Thermometry based on thermal expansion: Liquid in glass thermometers, BimetallicThermometers; Electrical resistance thermometry: Resistance Temperature Detectors,Thermistors; Thermoelectric Temperature Measurement: Temperature measurementwiththermocouples, thermocouple standards. Pressure and Velocity Measurement: Relativepressure scales,pressure reference instruments, barometer, manometer, deadweight tester,pressure gauges and transducers, total and static pressure measurement in moving fluids Flow measurement: Pressure differential meters: Orifice meter, Venturi meter, roto-meter.

Unit IV MARKS-16

Strain Measurement: Stress and strain, resistance strain gauges, gauge factor, strain gauge electrical circuits, multiple gauge bridge, bridge constant, apparent strain and temperature compensation, bending compensation. Motion, Force and Torque Measurement: Displacement measurement: Potentiometers, Linear variable differential transformers, rotary variable differential transformer; Velocity measurement: moving coil transducers; angular
velocity measurement: electromagnetic techniques, stroboscopic measurement; Force measurement: load cells, piezoelectric load cells;
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Unit V **MARKS-16**

Introduction to control systems: Examples of control systems. Open loop and closed loop control, Mathematical modeling of dynamic systems: Transfer function, impulse response function, block diagram of closed loop system, block diagram reduction, Transient and steady state response analyses: First order systems, unit step and unit impulse response of first order systems, second order systems, unit step and unit impulse response of second order systems, transient response specifications, modeling of mechanical systems, modeling of electrical systems, signal flow graphs, modeling of fluid systems, liquid level systems, hydraulic systems, modeling of thermal systems.

References:

1. Nakra and Chowdhry; Measurement and Control; TMH
2. Figiola RS & Beasley DE; Theory and Design for Mechanical Measurements; 3e John Wiley

Text Books:-

3. Katsuhiko Ogata; Modern Control Engineering, 4e Pearson Education, New Delhi
4. Gopal; Control Systems Principles and Design; Tata McGraw Hill, New Delhi.
5. Backwith and Buck; Mechanical Measurements.
6. Swahney; Metrology and Instrumentation;

List of Experiment (Expandable)(Measurement & control):

1- Study of various temperature measuring devices; thermo couple, RTD, gas thermo meters.
2- Measuring velocity of fluid flow by Ventura meter/ orifice meter/ pitot-tube.
3- Measuring torque and power generated by a prime mover by using pony brake

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BTCT-0705 ELECTIVE-I
(A) STRUCTURAL CERAMICS

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0705	ELECTIVE-I	3	1	2	6	80	25	20	100	-	-	-	-	100	3hrs

UNIT- 1 **MARKS:16**

Prerequisite: Basic courses of Ceramic science: Design parameters, various toughening methods, failure analysis.

UNIT- 2 **MARKS:16**

Fracture Toughness: Techniques of design and modern fabrication methods of components.

UNIT- 3 **MARKS:16**

Classification of structural ceramics, Applications of structural ceramic materials in space technology, power generation, automobile and biological application

UNIT- 4 **MARKS:16**

Ceramic films and coating (CVD,PVD) for structural applications, Non – oxide materials. Cermets, Ceramic cutting.

Tools, Processing techniques of composities, fibre preparation of oxide, non-oxide ceramics and glasses.

UNIT- 5 **MARKS:16**

Metal matrix composites, ceramic – ceramic composites, Glass ceramics, polymer matrix composites.

Study of fibres, particulars & wiskler, reinforced composites, Alumina, zirconia, forsterite, and cordierite, Polymorphism of ZrO2, martinsitic transformation and transformation, toughening of ZrO2

Recommended Books:

1. Modern ceramic engineering - D.W. Richardson
2. Material science and engineering - V. Raghavan
1. Physical ceramics for engineers - L.H. VanVlack
2. Introduction to ceramics - W.D. Kingery
3. Handbook of structural ceramics - Mel M. Schwartz, McGraw Hill Inc.
4. Engineering Composites – Chawla

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BTCT-0705 ELECTIVE-I (B) ELECTRO AND MAGNETIC CERAMICS

UNIT- 1 MARKS:16

Dielectric Properties

Dielectric constant and loss, polarization dielectrics, dielectric strength, ceramic dielectic materials, ceramic insulators such as glasses and porcelain, Linear dielectrics and non linear dielectrics, Phenomena of piezoelectricity, pyro-electricity and ferro-electricity, Study of piezoelectric / ferro-electric ceramic materials i.e. structure and electrical behavior of barium titanate, PZT and PLZT related materials

UNIT- 2 MARKS:16

Capacitors: Concepts and examples of titanates, alumina, steatites, mica.

Classification of capacitors – class-I and class-II capacitors, varieties of ceramic capacitors, preparation methods of MLC capacitors, Electro-Optical Ceramics:

Basic concepts and phenomena, compositional systems of electro optic ceramics, Study of PLZT based materials, their synthesis, fabrication and applications.

UNIT- 3 MARKS:16

Magnetic Ceramics: Basic theory, magnetic behavior, properties, diamagnetism, paramagnetism, ferromagnetism, anti-ferromagnetism, ferrimagnetism, exchange and indirect exchange interactions spin order, lattice interactions, ferrimagnetic and ferromagnetic domains and domain motion

UNIT- 4 MARKS:16

Classes of magnetic ceramics, spinel ferrites, structure of spinel ferrites, spinel spin lattice interactions, effect of composition in ferrites, effect of thermal treatment, oxidation states, manganese and nickel zinc ferrites, hexagonal ferrites, structure, properties, preparation and applications, Rare earth garnets, YIG etc. Structure and properties, preparation and applications

UNIT- 5 MARKS:16

Ionic Conductors: Examples of ionic conductors, theory of ionic conductivity, solid electrolytes, application of ionic conductors (zirconia) in solid oxide fuel cells and solid state batteries (inorganic glasses), Ceramic gas sensors, PTC and NTC thermistors, zinc oxide varistors, Superconductors and its applications

Recommended Books:

1. Electro-ceramics – J.M. Herbert & Moulson
2. Ceramic Materials for Electronics - R.C. Buchanan
3. Modern Ceramic Engineering - D.W. Richerson
4. Introduction to Ceramics - W.D. Kingery

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Semester-VIII

BTCT-0801 COMPOSITE MATERIALS

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0801	COMPOSITE MATERIALS	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

UNIT- 1 **MARKS:16**

Composite Materials: Definition, necessity, classification and importance, Fibers: Introduction. Glass fibers, boron fibers, carbon fibers – their fabrication, structure, properties and applications

UNIT- 2 **MARKS:16**

Organic fibers, ceramic fibers and metallic fibers, comparison of fibers – their fabrication, structure, properties and applications

UNIT- 3 **MARKS:16**

Matrix materials: Polymers, metals and ceramic matrix materials, Interfaces – wettability and bonding, interface in composites, interactions at the interface, types of bonding at the interface. Test for measuring interfacial strength

UNIT- 4 **MARKS:16**

Polymer matrix composites, metal matrix composites, ceramic matrix composites Carbon fiber composites and multi-filamentary superconducting composites Nano composites.

UNIT- 5 **MARKS:16**

Elementary treatment of micro and macro mechanics of composites Strength, fracture, fatigue and design.

Recommended Books:

1.Composite Materials (Science and Engineering) – K.K. Chawla, Springer-Verlag New York Inc., 1987.
2.Introduction to Materials Science for Engineers - James F. Shackelford, Macmillan publishing Co., NewYork.
3.Materials Science and Engineering - L.H. VanVlack, Addison – Wesley Publishing company
4.Modern Ceramic Engineering - D.W. Richerson
5.Handbook of Composite Materials - American Chemical Society

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List of Experiments

1. To determine viscosity of a given coal tar with the help of tar viscometer.
2 To determine the flash and fire points of the given oil sample by Penskey Martin's apparatus..
3. To determine the flash and fire points of the given oil sample by Abel's apparatus.
4. To determine the flash and fire points of the given oil sample by Cleveland apparatus.
5. To determine the carbon residue of the given oil by Conradson method.
6. To determine cloud and pour point of given oil sample (coconut) by cloud and pour point apparatus.
7 To determine the composition of given gas by Orsat apparatus.

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BTCT-0802 ADVANCED REFRACTORIES

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0802	ADVANCED REFRACTORIES	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

UNIT- 1 **MARKS:16**

Introduction, Novel refractory ceramics for energy production and utilization, long life refractories for steel plant, economy of use of refractories in steel and allied plants, Recent trends in the application of refractories for glass tank furnaces i.e., regenerator structure, rider arch, checker work and chimney blocks models, regenerator system.

UNIT- 2 **MARKS:16**

Non-Oxide Refractories: Properties, preparation and application, Silicon Carbide, Types of silicon carbide, properties of silicon carbide, effect of microstructure, grain size, porosity on properties, SIC fibers, and applications. SiC heat exchangers, Silicon Nitride, Silicon nitride preparation, types and properties, Effect of grain size, grain boundary composition, porosity on performance of silicon nitrides. Study of silicon nitride fibers and silicon nitride heat exchangers

UNIT- 3 **MARKS:16**

Oxide Refractories: High Performance oxide ceramics, Alumina refractories, Study of preparation of synthetic raw materials i.e., tabular alumina, sintered alumina, fused alumina, etc. Special shapes, high performance-high alumina monolithic refractories, Castables: Study of Calcium Aluminate Cement and Refractory Castable, Development of Low Cement Castables.

UNIT- 4 **MARKS:16**

Kiln Furniture and Miscellaneous Refractories: Setters and kiln furnitures of cordierites (MAS) based refractories Estimation of heat loss due to mass of setters and kiln furnitures, Lithium aluminium silicate (LAS) for heating chambers

UNIT- 5 **MARKS:16**

Refractory filters used in steel plants. Addition of metal ingredients to increase life of refractories, Recuperator and regenerator tubes of SiC and Si3N4, Preparation, Properties and Application of Forsterite

Recommended Books:

1.Introduction to ceramics – W.D. Kingery
2.Refractories – F.H. Nortan
3.Steel plant refractories – F.H. Nortan Refractories.
4.Refractories – Kenneth Shaw
5.Refractories – Nandi
6.Refractories – Budnikov
7.Refractories – Chesters

List of Experiments

1Determination of Refractoriness (PCE) of refractory material.
2. Determination of Thermal Spalling Resistance of refractory material.
3. Determination of Thermal conductivity of refractory material.
4. Determination of Modulus of Rupture of refractory material.
5. Determination of Reversible Thermal Expansion of refractory material.
6. Determination of Creep Resistance of refractory material.
7. Determination of carbon-monoxide disintegration test for refractory material.
8. Determination of loss on ignition.
9. Determination of adsorbed moisture.
10. Determination of chemically combined water.

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BTCT-0803 PLANT EQUIPMENT & FURNACE DESIGN

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0803	PLANT EQUIPMENT & FURNACE DESIGN	3	1	2	6	80	25	20	100	50	15	50	100	200	3hrs

UNIT- 1 **MARKS:16**

General idea of common equipment used in ceramic and cement industry, Processing equipment and pollution equipment, Basic consideration in process equipment design, materials of construction, design considerations. Process Flow diagrams piping and instrumentation diagrams

UNIT- 2 **MARKS:16**

Pressure vessels: Introduction, operating condition, pressure vessel code, selection of materials, design and stresses, numerical problems, Storage vessels: Design of spherical tanks, Design of rectangular tank.

UNIT- 3 **MARKS:16**

Design consideration of filters. Filter presses: design conditions and constructional features. Selection of materials for construction, Furnace aerodynamics, determination of adiabatic flame temperature, energy calculation in furnaces, essential operational instruments.

UNIT- 4 **MARKS:16**

Equipment of furnaces: Air heating equipment, oil firing burners, charging equipments, Heating up and cooling down of any one type of furnace, melting and furnace life and refractories, Design of the following: Glass melting furnace, tunnel kiln, rotary kiln tunnel dryers, annealing heaters.

UNIT- 5 **MARKS:16**

Study of constructional features of the following furnaces: Blast furnace, Muffle furnace, Open hearth furnace, Stacks, chimneys and chimney foundations.

Recommended Books:

1. Equipment Design - M.V. Joshi.
2.Plant Design - Vibrandt and Drydew.
3. Fuels furnaces and Refractories – Gilchrist
4.Furnaces – Trinks
5.Industrial Furnaces – Ethrington
6.Glass tank furnaces – Gunther

List of Experiments:

1. To carry on proximate analysis of the given coal sample.
2. To determine the calorific value of the coal by Bomb-Calorimeter method.
3. To determine the viscosity of the given oil sample by Redwood Viscometer. No. 1 and
4. No. 2
5. To determine the viscosity of a given oil sample by Saybolt viscometer.
6. To determine viscosity of a given coal tar with the help of tar viscometer.
7. To determine the flash and fire points of the given oil sample by Penskey Martin's apparatus..
8. To determine the flash and fire points of the given oil sample by Abel's apparatus.
9. To determine the flash and fire points of the given oil sample by Cleveland apparatus.
10. To determine the carbon residue of the given oil by Conradson method.
11. To determine cloud and pour point of given oil sample (coconut) by cloud and pour point apparatus.
12. To determine the composition of given gas by Orsat apparatus.

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BTCT-0804 ELECTIVE-II
(A) DESIGN WITH CERAMICS

Course code	Title of the Paper	Periods Per week				Distribution of Marks								Grand Total (i= d+h)	Duration of Exam
						Theory		MST (c)	Total (d = a+c)	Practical		TW (g)	Total (h= e+g)		
		L	T	P	C	Max (a)	Min (b)			Max (e)	Min (f)				
BTCT-0804	ELECTIVE-II	3	1	2	6	80	25	20	100	0	0	0	0	100	3hrs

UNIT- 1 **MARKS:16**

Plastic deformation, viscous flow and creep: Introduction, plastic deformation of rock salt structure,

UNIT- 2 **MARKS:16**

Crystals, theories, structure of crystals, deformation of Alumina Crystals, creep of single crystal and polycrystalline ceramics.

UNIT- 3 **MARKS:16**

Elasticity, Anelasticity and strength: Introduction, Elastic moduli, Anelasticity, Brittle Fracture and crack propagation, static fatigue, creep fracture, effects of Microstructure.

UNIT- 4 **MARKS:16**

Design with Ceramics: Design Consideration, Design approaches, failure analysis, toughening of Ceramics, Reliability, weibull modulus,

UNIT- 5 **MARKS:16**

Application: Material Selection.

Recommended Books:

1.Modern Ceramic Engineering – D.W. Richerson, Marcel Decker , Inc, New York.
2.Introduction to Ceramics – W.D. Kingery, John Wiley and Sons , New York

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BTCT-0804 ELECTIVE-II
(B) PHYSICAL PROPERTIES OF MATERIALS

UNIT- 1 **MARKS:16**

Crystal Chemistry – Fundamentals: Introduction to Properties; Periodic Table and the Atom; Types of Chemical Bonds; Crystal Structure, Real crystals : Defects in crystals, Influence of Crystal Structure on Properties; Ceramic Compounds – Classes and Properties. Glass and glass – ceramics.

UNIT- 2 **MARKS:16**

Inorganic Chemistry: Phase Equilibrium - Single, Binary Systems, Ternary and Complex System, Typical Binary Such as alumina – silica, magnesia – calcia, chromia and alumina and other important ceramic Systems. Reactions between Compounds, Diffusion, Diffusion mechanisms, sintering, sintering mechanism, Solid phase sintering, liquid phase sintering.

UNIT- 3 **MARKS:16**

Physical Properties: Microstructure of Ceramics, Physical Properties of Triaxial Whitewares, Physical Properties of Electro – Ceramics, Refractories and glass ceramics, Optical Properties of Ceramics: Transparency, absorption, color and coloring agents, fluorescence and phosphorescence.

UNIT- 4 **MARKS:16**

Thermal Properties of Ceramics: Melting point, glass transition temperature, creep, thermal conductivity, and thermal expansion.

UNIT- 5 **MARKS:16**

Dielectric Properties of Ceramics: Polarization, temperature and frequency effects, electric break down, ferroelectric materials.

Recommended Books:

1.Materials sciences and Engineering – V. Raghavan, PHI, New Delhi.
2.Physical Ceramics for Engineers – L.H. Van Vlack, Addison – Wesley Publishing company.
3.Materials Science and Engineering – L.H. Van Vlack, Addison – Wesley Publishing company.
4.Introduction to Ceramics – W.D. Kingery, Wiley, New York.