



RAIPUR | INDIA

KALINGA UNIVERSITY

SCHEME & SYLLABUS FOR

Bachelor of Vocational Studies (B.Voc.) Cement Technology



Kalinga University, Naya Raipur, Chhattisgarh

B.VOC IN CEMENT TECHNOLOGY

Semester - I								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total
BVCMT101	Communication Skills	3	3	0	0	30	70	100
BVCMT102	Fundamentals of Information Technology	3	3	0	0	30	70	100
BVCMT103	Introduction to Cement, Cement Raw Materials, Geology and Mining of Limestone	3	3	0	0	30	70	100
BVCMT104	Fuels, Furnaces and Pyrometers	3	3	0	0	30	70	100
BVCMT105P	Industrial Training/On Job Training/Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester - II								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total
BVCMT201	Soil and Foundation Engineering	3	3	0	0	30	70	100
BVCMT202	Environmental Studies	3	3	0	0	30	70	100
BVCMT203	Refractories	3	3	0	0	30	70	100
BVCMT204	Safety, Health and Environment	3	3	0	0	30	70	100
BVCMT205P	Industrial Training/On Job Training/Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester - III								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total
BVCMT301	Raw Mix Design and Chemistry of Cement	3	3	0	0	30	70	100
BVCMT302	Process Control	3	3	0	0	30	70	100
BVCMT303	Concrete Technology	3	3	0	0	30	70	100
BVCMT304	Building Construction	3	3	0	0	30	70	100
BVCMT305P	Industrial Training/On Job Training/Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester - IV								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total
BVCMT401	Size Reduction and Homogenisation	3	3	0	0	30	70	100
BVCMT402	Pyroprocessing and Clinker Formation	3	3	0	0	30	70	100
BVCMT403	Plant Equipment and Furnace Design	3	3	0	0	30	70	100
BVCMT404	Performance of Cement and Concrete	3	3	0	0	30	70	100
BVCMT405P	Industrial Training/On Job Training/Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester - V								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total
BVCMT501	Quality Control in Cement Manufacture	3	3	0	0	30	70	100
BVCMT502	EIA and EMP of Cement Plant	3	3	0	0	30	70	100
BVCMT503	Special Cements and Application	3	3	0	0	30	70	100
BVCMT504	Material and Energy Balance	3	3	0	0	30	70	100
BVCMT505P	Industrial Training/On Job Training/Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

Semester - VI								
Course Code	Course Title	Credits	L	T	P	Internal Marks	End Semester Exam Marks	Total
BVCMT601	Utility and Maintenance in Cement Plant	3	3	0	0	30	70	100
BVCMT602	Marketing Strategy of Cement	3	3	0	0	30	70	100
BVCMT603	Project and Plant Management	3	3	0	0	30	70	100
BVCMT604	Renewable Energy System	3	3	0	0	30	70	100
BVCMT605P	Industrial Training/On Job Train-ing/ Workshop	18	0	0	36	50	150	200
Total		30	12	0	36	170	430	600

SEMESTER-01

BVCMT101

COMMUNICATION SKILLS

Course Objective:

- The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

Course outcomes:

- The purpose of this course is to introduce students to the theory, fundamentals and tools of communication
- To develop vital communication skills which should be integral to personal, social and professional interactions.
- One of the critical links between human beings.
- An important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal.
- In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

Unit 1:

06

- **Introduction:** Theory of communication, types and modes of communication, mediums and channels of communication, barriers to communication, English as a global language, the lingua franca, social influences on English

Unit 2:

06

- **Language of Communication:** Verbal and non-verbal (spoken and written) personal, social and business barriers and strategies intra-personal, inter-personal and group communication, varieties of English, language, accent, dialect, colloquialism, historical influences on English

Unit 3:

06

- **Speaking Skills:** Monologue, dialogue, group discussion, effective communication/mis-communication, interview, public speech, regional influences on English, convergence and divergence, linguistic imperialism

Unit 4:

06

- **Reading and Understanding** Close reading, reading analysis of a text - audience and purpose, content and theme, tone and mood, stylistic devices, structure comprehension- analysis and interpretation, translation (from Indian language to English and vice-versa), literary/knowledge texts

Unit 5:

- **Writing Skills:** Documenting report writing making notes letter writing, writing tabloids, diary entry, open letters, essays, newsletter and magazine articles, skits, short stories, impersonating characters it will enhance language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note taking etc. while, to an extent, the art of communication is natural to all living beings, in today's world of complexities, it has also acquired some elements of science. it is hoped that after studying this course, students will find a difference in their personal and professional interactions.

References:

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr. Ranjana Kaul, Dr. Brati Biswas

BVCMT102

FUNDAMENTALS OF INFORMATION TECHNOLOGY

Course objective:

- This is a basic course for commerce students to familiarize with computer and its applications in the relevant fields and exposes them to other related courses of IT.

Course Outcomes:

- Gain a foundational understanding of key IT concepts, including hardware, software, and networks.
- Develop proficiency in using common computer applications, such as word processing and spreadsheet software.
- Explore the ethical and security considerations in IT, emphasizing responsible digital behavior.
- Acquire problem-solving skills by applying IT knowledge to real world scenarios.
- Prepare for further studies in IT or related fields by establishing a strong IT knowledge base.

Unit-1:

06

- **Computer characteristics:** Speed, storage, accuracy, diligence; digital signals, binary system, ASCII; historic evolution of computers;
- **Classification of computers:** microcomputer, minicomputer, mainframes, supercomputers;
- **Personal computers:** desktop, laptops, palmtop, tablet; hardware & software; von Neumann model.

Unit-2:

06

- **Hardware:** CPU, memory, input devices, output devices.
- **Memory units:** RAM (SDRAM, DDR RAM, RDRAM etc. feature wise comparison only); ROM-different types: Flash memory;
- **Auxiliary storage:** Magnetic devices, optical devices; floppy, hard disk, memory stick, CD, DVD, CD/DVD-Writer;
- **Input devices** - keyboard, mouse, scanner, speech input devices, digital camera, touch screen voice input, joystick, optical readers, bar code reader;
- **Output devices:** Display device, size and resolution; CRT, LCD, LED;
- **Printers:** Dot-matrix, inkjet, laser; plotters, sound cards & speaker.

Unit-3:

06

- **Software:** System software, application software; concepts of files and folders, introduction to operating systems, different types of operating systems: single user, multitasking, time-sharing multi-user; booting, POST;
- **Basic features of two GUI operating systems:** Windows & Linux (Basic desk top management); Programming Languages, Compiler, Interpreter, Databases;
- **Application software:** Generic features of word processors, spread sheets and presentation software; generic introduction to latex for scientific typesetting; utilities and their use; computer viruses & protection, free software, open source.

Unit-4:

06

- **Computer Networks and Internet:** Connecting computers, requirements for a network: server, workstation, switch, router, network operating systems; internet: brief history, world wide web, websites, URL, browsers, search engines, search tips; internet connections: isp, dial-up, cable modem, well, dsl, leased line wireless and Wi-Fi connectivity ; email, email software features (send receive, filter, attach, forward, copy, blind copy); characteristics of web-based systems, web pages, web programming languages.

Unit-5:

06

- **Information Technology and Society:** Indian IT Act, intellectual property rights, issues. application of information technology in railways, airlines, banking, insurance, inventory control, financial systems, hotel management, education, video games, telephone exchanges, mobile phones, information kiosks, special effects in movies.
- **Programming Concepts & Techniques:** Program concept, characteristics of programme, stages in program development, tips for program designing, programming aids, algorithms, pseudo code, notations, design, flowcharts, symbols, rules, compiler & interpreter. introduction to programming techniques, top-down & bottom-up approach, unstructured, & modular programming, cohesion, coupling, debugging, syntax & logical errors, linking and loading, testing and debugging, documentation.

References:

1. Programming in C, R.S. Salaria, Khanna Publishing House
2. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
3. Handbook of Computer Fundamentals, N.S. Gill, Khanna Publishing House

BVCMT103

INTRODUCTION TO CEMENT, CEMENT RAW MATERIALS, GEOLOGY AND MINING OF LIMESTONE

Course Objective:

- The course is designed to know the history of cement, chemical and Physical characteristic of Cement Raw materials, Distribution of limestone deposits in India, Assessment of limestone deposit and mine planning.

Unit –1:

08

- **Introduction to Cement and cement manufacturing process:** What is cement and its importance in construction, History of cement and Cement manufacturing process, material composition of cement, various unit operation of cement manufacture, the present status and future of cement industry in India.

Unit-2:

08

- **Types of Cement:** Description and use of various type of Cement such as, Ordinary Portland Cement, Portland Pozzalana Cement, Portland Slag Cement, Sulphate Resistant Cement, White Portland Cement, and Low heat Cement, Masonry Cement, Oil Well Cement.

Unit-3:

07

- **Calcareous Raw Materials:** Source of Lime, Limestone, Chalk, Marl, Industrial waste, geological distribution of limestone deposits in India, Assessment of limestone deposits for Cement manufacture. Argillaceous Raw Materials: Source of Silica, Alumina, Iron Oxide, Shale and effect of coal ash and additives use as corrective materials, Fly ash, Slag, lime sludge as cement raw materials.

Unit- 4:

07

- **Deposit Evaluation:** Prospecting and Exploration of limestone deposit, Classification of limestone deposit, Reserve Estimation, Statistical and Geostatistical evaluation, Computer Aided Deposit Evaluation.
- **Mine Planning:** Introduction to surface mining, method of mining of limestone deposits, estimation of block size and bench height, estimation of block wise bench wise grade and tonnage, selection of mining equipment (Excavator, Dozer, Dumper etc.), Blasting techniques, type of explosive use, Mine production scheduling, Advance method of limestone mining, equipment safety in mining operation, pit head quality control.

References:

1. Cement Data Book: W. H Duda , Verlag G m Bh,Berlin
2. Norms for limestone exploration for cement manufacture : NCCBM
3. National Inventory of cement grade limestone deposits in India : NCCBM
4. Text Book of Geology : P K Mukherjee
5. A Hand book on Surface Mining Technology : Samir Kumar Dash, , Khargpur

BVCMT104

FUELS, FURNACES AND PYROMETERS

Course Outcomes:

After undergoing the subject, the students will be able to:

- Understand types of fuels required for ceramic industry
- Know in detail of various solid, Liquid & Gaseous fuels base kilns
- Know the construction & operation of various type Ceramic Kilns
- Know regarding various types of metallurgical furnaces and their Construction & Operation
- Know the conservation of energy in the of ceramic Kilns
- Understand general idea on Pyrometer, Pyroscope, Thermocouple

FUEL:

Unit 1:

08

Introduction to Fuel & Combustion:

- State & Explain introduction to solid, Liquid and Gaseous fuels
- Explain Non-conventional source of energy for burning ceramic Kiln
- State and explain combustion of fuels
- Combustion calculation
- Spontaneous combustion, its causes and remedy.
- Terms & Definition relating to Fuel testing

Solid Fuels:

- State various types of solid fuels
- Classify solid fuels
- Describe the methods/ theories of formation of Coal
- State & explain the properties/nature of Coal and occurrence,
- Describe impurities in coal, grading of coal, reason for washing of coal,
- Describe hardness and grind ability of coal, agglomeration and swathing of coal, calorific value of coal, coal ash and clinkering.
- Describe in detail how coke is prepared in coke oven and state properties of coke

Liquid Fuels:

- State various types of liquid fuels
- Classify liquid fuels, Nature of oil, its origin and composition
- Describe the process of refining for the crude petroleum product- petrol, kerosene, Diesel
- Describe the procedure for storage and handling practices of liquid fuels in industry.
- State the advantages of liquid fuels over solid fuels.
- Testing of liquid fuels such as flash point, fire point, pour point, smoke point, dew point

Gaseous Fuels:

- Classify gaseous fuel
- Design and description of producer gas plant, chemical reactions, composition and calorific value in relation to operating conditions and quality of coal.
- Describe the manufacturing method of Bio Gas
- Describe Water Gas, Carbureted water gas. Coke oven Gas, Blast furnace Gas, Coal Gas, Oil Gas, BOF Gas, Refinery Gases, low and high temperature carbonization,
- Describe the Natural Gas-Composition and calorific value.
- Explain the advantages of gaseous fuel over liquid and solid fuel
- Describe the Rocket Fuels and Nuclear Fuels

Unit 2:

08

Ceramic Kilns:

- Define the Kiln, Furnace and Oven
- Classify ceramic kiln/Furnace in details – as per used fuel, Shape, working method(Periodic, Continuous kiln)
- List the advantage of continuous kiln over periodic kiln
- Describe various type of kiln furniture used in ceramic kilns
- Describe the construction & operation of the following kilns with sketch in detail:-
 - a) Scobs /woodfibre kiln
 - b) Down Draft Kiln
 - c) Up Draft Kiln
 - d) Chamber kiln
 - e) Muffle kiln - Modern muffle kilns for enamel industries.
 - f) Shaft kiln
 - g) Tunnel kiln - advantages of muffle type tunnel kiln.
 - h) Rotary kiln
 - i) Roller hearth kiln

FURNACES

Unit 3:

07

- Classification of Furnaces
- Furnace used in Glass plant & their classification
- Furnace & Fuel used in Steel plant & their classification
- Sketch the following furnaces showing various section
 - a) Glass Melting Tank Furnace
 - b) Glass Melting Pot Furnace (Day tank furnace)
 - c) Blast Furnace
 - d) Muffle Furnace-
 - e) Cupola
 - f) Open Hearth Furnace
 - g) Basic Oxygen Furnace (BOF)
 - h) Electric Arc Furnace

- **Continuous Kilns:** Fundamentals of continuous kilns- construction, working and firing circuits
Methods of setting in continuous kilns.
- **Importance of Chimney for Kiln & Furnaces:** chimney construction, draught pressure and chimney draught.
- **Burner & Blower Equipments:** Design and operation of Burners, Burner efficiency, blowers And measurement of air flow meater, regenerator, recuperator etc.

PYROMETERS

Unit 4:

07

- Definition pyroscope & pyrometer, classification of pyrometers,
- seger cones - classification of cones, Behaviour of cones etc.
- Thermo electric pyrometers - general principle, Material used for thermal junction - chromel-Alomel, Platinum -Rhodiun etc.,
- Indicators, recorders, Advantage of thermo electric method of measuring
- Optical pyrometers: General Prinicple, Lien's law of Ferry's optical pyrometer, Le – Chateleir's optical pyrometer, colour extinction pyrometer.
- Resistance Pyrometers, Radiation Pyrometers: Ferry's mirror pyrometer, Ferry's spiral radiation pyrometer, indicators for radiation pyrometers.

References:

1. Fuels and Combustion by S.Sarkar
2. Fuels Solid, liquid & Gaseous by J.S.S.Brame & King
3. Furnace by Trink
4. Industrial Ceramic by singer and singer
5. Fuels Furnace Refractory by O.P.Gupta

BVCMT105P
**INDUSTRIAL TRAINING/ON JOB TRAINING/
WORKSHOP**

SEMESTER-02

BVCMT201

SOIL AND FOUNDATION ENGINEERING

Unit 1:

06

Introduction:

- Importance of soil studies in Civil Engineering
- **Geological origin of soils with special reference to soil profiles in India:** Residual and transported soil, Alluvial deposits, lake deposits, dunes and loess, glacial deposits, conditions in which above deposits are formed and their engineering characteristics.
- Names of organizations dealing with soil engineering work in India, soil map of India

Physical Properties of Soils:

- Constituents of soil and representation by a phase diagram
- Definitions and meaning of void ratio, porosity, degree of saturation, water content, specific gravity, unit weight, dry unit weight of soil grains
- Simple numerical problems with the help of phase diagrams

Unit 2:

06

Soils Classification and Identification:

- Particle size, shape and their effect on engineering properties of soil
- Gradation and its influence on engineering properties
- Relative density and its use in describing cohesion less soils
- Behaviour of cohesive soils with change in water content, Atterberg limits-definitions, use and practical significance
- Field identification tests for soils
- BIS soil classification system as per IS 1498; basis, symbols, major divisions and sub divisions, groups, plasticity chart; procedure to be followed in classifying a given soil into a group
- Black cotton soils: Properties and their effect on construction of buildings and other structures

Flow of Water through Soils:

- Concept of permeability and its importance
- Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability
- Comparison of permeability of different soils as per BIS
- Measurement of permeability in the laboratory

Unit 3:

06

Effective Stress: (Concept only)

- Stresses in subsoil
- Definition and meaning of total stress, effective stress and neutral stress
- Principle of effective stress
- Importance of effective stress in engineering problems

Deformation of Soils:

- Meaning, conditions/situations of occurrence with emphasis on practical significance of:
 - a) Consolidation and consolidation settlement
 - b) Creep
 - c) Plastic flow
 - d) Heaving
 - e) Lateral movement
- Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.
- Meaning of total settlement, uniform settlement, differential settlement and rate of settlement and their importance
- Settlement due to construction operations and lowering of water table
- Tolerable settlement for different structures as per BIS

Unit 4:

06

Strength Characteristics of Soils:

- Examples of shear failure in soils
- Factors contributing to shear strength of soils, Coulomb's law
- Determination of shearing strength, vane shear test, direct shear test and unconfined compression test. Brief idea about triaxial shear test.
- Drainage conditions of test and their significance
- Stress and strain curve, peak strength and ultimate strength, their significance
- Numerical problems

Soil Compaction:

- Various terms used to discuss degree of compaction and necessity of compaction
- Laboratory compaction test (standard and modified as per BIS) definition and importance of optimum water content, maximum dry density; moisture dry density relations for typical soils with different compactive efforts
- Field compaction; methods and equipment, choice of equipment
- Compaction control; Density control, field density test, (sand replacement), moisture control, Proctor's needle and its use, thickness control, jobs of an embankment supervisor in relation to compaction

Bearing Capacity:

- Concept of bearing capacity
- Definition and significance of ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure
- Bearing capacity from building BIS codes (IS 6403)
- Factors affecting bearing capacity
- Concept of vertical stress distribution in soils due to foundation loads, pressure bulb
- Plate load test (no procedure details) and interpretation of its results, limitations of plate load test
- Application of SPT and unconfined compression test and direct shear test in estimation of bearing capacity
- Soil properties governing choice of foundation type
- Improvement of bearing capacity (elementary), sand drain method compaction, use of geotextiles, grouting.

Unit 5:

Soil Exploration:

- Purpose and scope of soil exploration, economical aspects
- Undertaking planning of subsurface investigations
- Influence of soil conditions on exploratory programme
- Possibility of misjudgment of subsoil conditions
- Location, depth and spacing of exploration
- Influence of size of project and type of structure on exploratory programme
- Methods of soil exploration; Reconnaissance, Trial pits, borings, (Auger, wash, rotary, percussion to be briefly dealt), SPT (Brief description and information collected)
- Groundwater level measurement
- Sampling; undisturbed, disturbed and representative samples; selection of type of sample; thin wall and piston samples; area ratio, recovery ratio of samples and their significance, number and quantity of samples, resetting, sealing and preservation of samples.
- Presentation of soil investigation results

Foundation Engineering:

- Concept of shallow and deep foundation; types of shallow foundations and their suitability. Factors affecting the depth of shallow foundations, deep foundations, type of piles and their suitability; constructional features of pile foundations, pile classification on the basis of material, method of load transmission, method of installation.

BVCMT202

ENVIRONMENTAL STUDIES

Course Outcomes:

- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.

Unit 1:

06

Introduction to Environmental Studies:

- Multidisciplinary nature of environmental studies, Scope and importance; concept of sustainability and sustainable development.

Ecosystems:

- What is an ecosystem? Structure and function of the ecosystem;
- **Energy flow in an ecosystem:** food chains, food webs and ecological succession.
- **Case studies of the following ecosystems:** Forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-2:

06

Natural Resources:

- **Renewable and Non--renewable Resources:** Land resources and land use change; Land degradation, soil erosion and desertification.
- **Deforestation:** Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- **Water:** Use and over--exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter--state).
- **Energy resources:** Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

- Unit-3:** **06**
- Biodiversity and Conservation:**
- **Levels of biological diversity:** genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots, India as a mega-biodiversity nation; Endangered and endemic species of India
 - **Threats to biodiversity:** Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions;
 - **Conservation of biodiversity:** In-situ and Ex-situ conservation of biodiversity.
 - **Ecosystem and biodiversity services:** Ecological, economic, social, ethical, aesthetic and Informational value.
- Unit-4:** **06**
- Environmental Pollution:**
- Types, causes, effects and controls; Air, water, soil and noise pollution, Nuclear hazards and human health risks
 - **Solid waste management:** Control measures of urban and industrial waste. Pollution case studies.
- Environmental Policies & Practices:**
- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
 - **Environment Laws:** Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
 - Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.
- Unit-5:** **06**
- Human Communities and the Environment:**
- **Human population growth:** Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies.
 - **Disaster management:** floods, earthquake, cyclones and landslides.
 - **Environmental movements:** Chipko, Silent valley, Bishnois of Rajasthan.
 - **Environmental ethics:** Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

References:

1. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science*, 339: 36--37.
7. McCully, P. 1996. *Rivers no more: the environmental effects of dams*(pp. 29--64). Zed Books.
8. McNeill, John R. 2000. *Something New Under the Sun: An Environmental History of the Twentieth Century*.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology*. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. *Environmental and Pollution Science*. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment*. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. Tripathi 1992.
14. Sengupta, R. 2003. *Ecology and economics: An approach to sustainable development*. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics*. John Wiley & Sons.
17. Thapar, V. 1998. *Land of the Tiger: A Natural History of the Indian Subcontinent*.
18. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
19. Wilson, E. O. 2006. *The Creation: An appeal to save life on earth*. New York: Norton.
20. World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.

BVCMT203

REFRACTORIES

Unit 1: **06**

- **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: **06**

- **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: **06**

- 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: **06**

- 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: **06**

- 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.

References:

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

BVCMT204

SAFETY, HEALTH AND ENVIRONMENT

Course Objective:

- The course content is designed to familiar the student with Safety and Environment of cement plant operation.

Unit-1:

08

- **Safety:** Introduction to process of safety, Importance of safety, type of accident & causes, direct and indirect effect of accident, accident and loss statistics, safety consideration and design of cement plant, protective and safety devices for personal and general hygienic management in and around premises, respirators and ventilation system- local and dilution. Measure of risk, laws, rules and regulation conserving safety in cement plant for prevention of accident, managerial aspect of safety.

Unit-2:

08

- **Dust Generation and Control:** Both fugitive and point source of dust emissions in cement plant, classification of particle size distribution of dust, cement kiln dust characteristics, dust emission standards, health effects on workers exposure to dust, method of adoption to control of dust at the source, dust control equipment, such as gravity setting chamber, cyclones, ESP, Bag house filters and ESP with GCT efficiency of collection.

Unit-3:

07

- **Air pollution Control:** Emission source of CO, CO₂, NO_x and Sox, concerns about greenhouse gas emissions and climate change, health concern, source model- release and flow of toxic gases and particulates from the stack factors affecting their dispersion and modelling. Measuring equipment of exit gases, SO_x, NO_x and CO. Regulatory requirements, equipment required to control gaseous pollutants, recent development.

Unit-4:

07

- **Noise Abatement:** Noise of running machinery and mills, method of noise suppression, balancing of equipment, noise barriers, effect of plantation, effect on human health, regulatory requirement.
- **Environment around Mines:** Use of explosives, blasting and resultant vibration, controlled and sequential blasting, Ecological and environmental conditions around limestone mines, plantation, roads, water bodies, social forestry and safety measure
- **Management Techniques:** Concept of clean development mechanism, Environmental Impact Analysis (EIA) and Environmental Management Plan (EMP)

References:

1. Chemical Process Safety: Roy E. Sanders, Butter Worth Heinemann, New Delhi
2. Safety related acts and regulations
3. Environmental Pollution Control Engineering: C S Rao
4. Environmental Engineering: Peavey and Rowe

BVCMT205P
**INDUSTRIAL TRAINING/ON JOB TRAINING/
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SEMESTER-03

BVCMT301

RAW MIX DESIGN AND CHEMISTRY OF CEMENT

Course Objective:

- The objective of the course to understand chemical aspect of cement, its composition, cess manufacture and its influence on performance.

Unit-1:

08

- Sampling and pre blending of cement raw materials, estimation of Silica Modulus, Alumina Modulus, Hydraulic Modulus, Lime saturation Factor, Liquid Content, method proportioning, 2,3 and 4 component mixes, impact of moduli values on cement manufacturing process and quality of clinker.

Unit-2:

08

- Cement manufacturing process, chemical composition of various types cement, cement component and their phase relation, Binary and ternary compounds of cement and formation of eutectic.

Unit-3:

07

- Bauge's calculation, clinker minerals, absorption of constituents in clinker phases, phase diagram, chemical reaction during clinkerisation, Role of miner constituents in clinkerization, Thermo chemistry of clinker formation

Unit-4:

07

- Mineralizer, Role of additive in clinker formation, various mineralizer and fluxes, their role in manufacture of clinker
- Hydration of clinker minerals, role of gypsum in cement hydration process, hydration of Portland cement and strength of Portland cement

Reference Books:

1. F. M. Lea, Chemistry of Cement and Concrete, Arnold, London.
2. Cement Data Book: W. H Duda , Verlag G m Bh, Berlin
3. R. H. Bouge, Chemistry of Portland Cement, Reinhold, New York

BVCMT302

PROCESS CONTROL

Unit 1: **06**

- **Basic Concepts of Process Control:** Laplace transform of simple functions, transforms of derivatives, solution of differential equations, inversion by partial fractions.

Unit 2: **06**

- 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: **06**

- **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: **06**

- **Stability, Frequency Response Analyses and Design:** Stability: characteristic equation, Routh-Hurwitz criterion, Root-Locus analysis.

Unit 5: **06**

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

References:

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

BVCMT303

CONCRETE TECHNOLOGY

- Unit 1:** **08**
- Introduction Classification, properties, grades, advantage & disadvantages of concrete, Ingredients of concrete, types of cement, aggregates, water, admixtures
- Unit 2:** **08**
- **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,
- Unit-3:** **07**
- Basic considerations and factors influencing the choice of mix design, acceptance criteria for concrete, concrete mixes with Surkhi and other Pozzolanic materials.
- Unit 4:** **07**
- **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.
 - **Special Concretes:** Light weight concrete, ready mix concrete, Vacuum concrete, Ferro cement, Fiber reinforced concrete, Polymer concrete composites, Concrete, Guniting, Rubble concrete, Resin concrete, Prestressed concrete, Swami Vivekanand University, Sagar(M.P.)

References:

1. Varshney RS; Concrete Technology; Oxford & 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

BVCMT304

BUILDING CONSTRUCTION

Unit-1:

08

- **Stones:** Occurrence, varieties, Characteristics and their testing, uses, quarrying and dressing of stones. Timber: Important timbers, their engineering properties and uses, defects in Timber, seasoning and treatment need for wood substitutes, Alternate materials for shuttering Doors/windows, Partitions and structural members etc. Brick and Tiles: Manufacturing, Characteristics,

Unit-2:

08

- **Advance Construction Materials:** Use of fly ash in mortars, concrete, Fly ash bricks, stabilized mud blocks, non-erodible mud plinth, D.P.C. materials, Building materials made by Industrial & agricultural waste, clay products P.V.C. materials, advance materials for flooring, doors & windows, facial material, interiors materials for plumbing, sanitation & electrification.

Unit 3:

07

- **Foundation:** Type of soils, bearing capacity, soil stabilization and improvement of Bearing capacity, settlement and safe limits. Spread foundations, wall footings, grillage, Foundations well foundation, causes of failure and remedial measures; under reamed piles, Foundation on shrinkable soils, black cotton soil, timbering for trenches, dewatering of Foundations. Hyperbolic paraboloid.

Unit 4:

07

- **Masonry and Walls:** Brick masonry, Bonds, Jointing, Stone masonry, casting and laying, masonry construction, Brick cavity walls, code provisions regarding load bearing and nonload bearing walls. Common defects in construction and their effect on strength and performance of walls, designed Brick masonry, precast stone masonry block, Hollow concrete block, plastering and pointing, white and color washing, distempering
- **Floors and Roofs:** Types, minimum thickness, construction, floor finishes, Flat roofs, RCC jack arch, reinforced brick concrete, solid slab and timber roofs, pitched roofs, false ceiling, Roof coverings, Channel unit, cored unit, Waffle unit, Plank and Joist, Brick panel, L-Panel, Ferro cement roofing units, water proofing

References:

1. Mohan Rai & M.P. Jai Singh; Advance in Building Materials & Construction,.
2. S.C. Rangwala; Engineering Materials
3. Sushil Kumar; Building Construction,

BVCMT305P
**INDUSTRIAL TRAINING/ON JOB TRAINING/
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SEMESTER-04

BVCMT401

SIZE REDUCTION AND HOMOGENISATION

Course Objective:

- The purpose of this course is to familiarize with unit operations and practices related to size reduction, homogenization, blending and controls in a cement plant.

Unit-1:

08

- **Particle Size Analysis:** Sieve analysis, cumulative and fractional plot, size distribution, size averaging and equivalence, size estimation in sub-micron range. Optimum sizes at various stages from extraction from mines. Influence of size fraction on reactivity of lime stone. Screening equipments such as grizzlies, stationary, vibrating, curved and DSM screens & screen capacity.

Unit-2:

08

- **Size Reduction:** Laws of size reduction (Bond's, Rittinger's & Kick's); energy requirement in size reduction; work index. Theory of crushing & grinding; crushing efficiency; size reduction machinery crushers such as Jaw crusher, gyratory crushers, impact crushers, roll crushers and cone crushers; Grinders such as hammer mills, roller mills and ball mills & tube mills..

Unit-3:

07

- **Material Handling:** Various systems of material handling; haulage and transportation from mines, trucks, dumpers etc.
- **Conveying of Solids:** Conveyor selection, classification of conveyors, conveyors such as belt, screw, chain, vibratory, apron. Pneumatic and hydraulic transportation of solids; pneumatic conveying systems.
- **Storage of Solids:** Bins, silos, hoppers & feeders; storage of raw materials in piles Size Classification and Air Separators: Methods of size classification, principles of air separators, and different types of air separators used in cement manufacturing. Wet classification; hydro-cyclones; cyclone material balances in open circuit and closed circuit operations & separating efficiency.

Unit-4:

07

- **Blending & Prehomogenization:** Preparation of cement raw meal as per raw mix design, combined & segregated pre homogenization, Methods of Prehomogenization, stacking of blending beds, Chevron method, Windraw method, Areal stock piling, Axial stock piling, continuous stock piling, Equipments used for reclaiming material from stockpiles such as scraper, bucket wheel, bucket wheel with slewing boom and drum re-claimers. Blending bed theory; batch & continuous homogenization; Fuller's one-eight blending method. Stacking of blending beds namely in longitudinal & circular stockpiles system & their comparison.

References:

1. Cement Data Book: W. H Duda, Verlag G m Bh, Berlin
2. Cement Engineers Hand Book: Labhaan and Kolhaans
3. Operational Norms for cement plant: NCCBM publication

BVCMT402

PYROPROCESSING AND CLINKER FORMATION

Course Objective:

- The emphasis of the course will be on description of operations in a cement kiln and manufacture of cement. Completion of this course, a student will be familiar with the operation in a cement kiln and controls.

Unit-1:

08

- **The Cement Kiln Operation:** Types of kilns, different types of clinkerization process, wet process, semi-wet process, dry process, advantages- disadvantages of each process, chain type system in wet process, Lepol grate kiln, heat requirement in each process, L/D ratio. Thermal calculations, sizing of kiln. Heat balance of kiln, air balance of kiln, inlet seal, methods used to feed raw meal to kiln, different types of preheaters, types of precalcinators their advantages and disadvantages, selection of preheaters, affect of leakages on kiln operation, optimization of kiln output, factors affecting kiln output.

Unit-2:

08

- **Coal Grinding Plant:** Preparation of fuel burning, sampling of coal, proximate and ultimate analyses of coal, calorific value of coal and its determination, crushing and grinding of coal, residue and moisture determination and their control, removal of fine coal from dust-laden gases, different equipments used, cyclones, bag filters and ESPs.

Unit-3:

07

- **Firing system:** different types of firing systems, their advantages and disadvantages, conveying of pulverized coal to kiln, calcinations and its control, process parameters like velocity, temperature and draught at various stages, burners, development in burner system

Unit-4:

07

- **Cooling Of Clinker:** Different types of coolers used, their operation and control, planetary coolers; grate coolers, cooling efficiency, air requirement for cooling operation, different methods of clinker cooling and their advantages, methods of clinker storage-silo and gantry.
- **Refractories:** Temperature profile inside kilns, functions of refractories, different types of refractories, ceramic phase diagrams

References:

- The Rotary Cement Kiln, Edward Arnold. K. E. Perey,
- Chemistry of Cement and Concrete, Arnold, London. F. M. Lea
- Cement Chemistry, Academic Press, London.: H. F. W. Taylor
- Innovations in Portland Cement Manufacturing: Bhatta

BVCMT403

PLANT EQUIPMENT AND FURNACE DESIGN

- Unit- 1:** **06**
- 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:** **06**
- **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:** **06**
- 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:** **06**
- **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:** **06**
- **Study of constructional features of the following furnaces:** Blast furnace, Muffle furnace, Open hearth furnace, Stacks, chimneys and chimney foundations.

References:

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

BVCMT404

PERFORMANCE OF CEMENT AND CONCRETE

Course Objective:

- To get a broad perspective of cement and concrete performance

Unit-1:

08

- **Application of Cement and Performance Requirement:** Concrete and mortars, introduction to various infrastructure and use of cement, Requirement of setting, strength and durability of different concrete constructions, effect of chemical composition and physical characteristic of cement on performance, fineness and particle size distribution , tailoring performance of cements.

Unit-2:

08

- Classification of aggregate, source Physical, Chemical and Thermal properties of aggregate, Grading of aggregate, Quality of water used for construction, use of sea water for mixing of concrete.

Unit-3:

07

- Introduction to admixture, construction chemicals, plastisizers, use of admixture in concrete, factors affecting the workability of concrete, effect of superplastisizer on the properties of harden concrete, retarder, acceleator, pozzolanic or mineral admixture, construction chemicals for water proofing.

Unit-4:

07

- **Properties of fresh and hardened concrete:** workability and its measurement, factors affecting workability, requirements of workability, Estimation of errors, Strength of concrete , stress and strain characteristics of concrete, Dimensional stability- shrinkage and creep, creep of concrete , permeability of concrete, durability of concrete, concrete in marine environment, acid attack, Efflorescence , fire resistance, Thermal properties of concrete
- Concept of concrete mix design, various method of mix design, Indian method of concrete mix design, sampling and acceptance criteria in mix design, Inspection and testing of structures : core test, Load test, nondestructive test, Special concrete and concreting methods, Light weight concrete, Light weight aggregate concrete, High density concrete, Fibre reinforced concrete.

References:

1. Chemistry of Cement and Concrete: F M Lea, Arnold, London
2. Properties of Concrete : Neville, A.M. Longmans.
3. Concrete Technology : M L Gambhir
4. Concrete Technology : Theory & practices :M S Shetty.

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SEMESTER-05

BVCMT501

QUALITY CONTROL IN CEMENT MANUFACTURE

Course Objective:

- To get a detailed review of quality policies and quality objective in cement plant

Unit-1:

08

- **Statistical concepts:** Treatment of variability , histograms , means, standard deviation ,variance, co-efficient of variation , estimation of standard error of means , control charts ,Theoretical distribution: Normal and log Normal distribution
- **Statistical Quality Control:** control charts , advantages of quality control, acceptance & sampling

Unit -2:

08

- **Input control:** control of input at various stages of production , control of raw materials, raw meal and kiln feed, chemical composition and physical characteristics , norms of control

Unit -3:

07

- **Specifications:** Quality and specification requirements, minimum value specified, average values expected in production , acceptance criteria National & International Specifications differences in test methods , comparison of requirements Scheme of Testing And Inspection Detailed requirements of STI issued by Bureau of Indian Standards

Unit -4:

07

- **Quality Assurance:** Need, Principles, Essentials and Advantages of Quality Assurance System, Quality Manual, Field complaints, Quality Audit & its types, Quality Assurance Methods
- **Quality systems:** Brief on, ISO: 9001–2000 Quality management systems. Description of TQM Concept of quality circles, Practices of quality Control system in a cement plant.

References:

1. "Statistical Quality Control", McGraw Hill & Co.: EL Grant & RS Leavenworth
2. "Statistical Quality Control", Dhanpat Rai & Co.: M. Mahajan
3. "Statistical Quality Control", Dhanpat Rai & Co.: O.P. Khanna
4. "Statistical Quality Control", Khanna Pulishers: R.C. Gupta
5. Guide Norms for cement plant operations, NCB Publication.
6. "Fundamentals of Quality Control", Pearson Education: Amitav Mitra
7. "Total Quality Control", McGraw Hill & Co: Feigenbaum.
8. "Quality Control systems", McGraw Hill Int. Education: Taylor J.R.

BVCMT502

EIA AND EMP OF CEMENT PLANT

Course Objectives:

- Understand the importance of Social Impact Assessments and public participation in the EIA process.
- Identification of mitigating strategies, such as prevention and control, for each environmental component, as well as a restoration and resettlement strategy.
- Describe all monitoring procedures required to identify environmental impacts.

Course outcomes:

Students after successful completion of the course will be able to:

- Check water quality
- Utilize 5 techniques to control pollution
- Understand impacts of Cement plant on Environment
- Demonstrate 6 Environment Management Acts
- Identify ambient air quality

Unit 1:

06

Introduction:

- The Environment, Interaction of Humans and Environment.
- Role of an engineer in Environmental improvement. Present Environmental Scenario: socio economic studies, buffer zone, and demographic profile.
- Environmental quality, air environment, micro-meteorology, dust environment, water quality, noise level.

Unit 2:

06

Sources of Pollution in Cement Industry:

- Air Pollution – Sources, Ambient Air Quality, Fugitive dust, Point Source – Green House Gas, particulate matter (PM), SO₂, NO_x, CO, HCl, HF, Heavy Metals, Dioxins & Furans, TOC, TVOC etc.
- Water pollution – Sources, Consumption, waste water generation, storm water.
- Noise pollution – Sources, Solid and Hazardous Waste – utilization.

Unit 3:

06

Environmental Impact Assessment:

- Impact on socio economic factors, Impact due to land degradation, impact on topography and drainage, impact due to solid waste, impact due to coal stocks, impact on flora and fauna.
- Impact on safety, impact on environmental quality, ambient air quality, impact on water quality, impact on noise levels.
- Mathematical modelling for dispersion of air pollutants, Battelle Environmental Evaluation System.

Unit 4:

06

Environment Management Act:

- Introduction to various Environmental Act & Regulations, Environment Protection Act 1986, Water (Prevention and Control of Pollution) act, Water (Prevention and Control of Pollution) Cess act, Air (Prevention and Control of Pollution) act,
- Forest (Conservation) Act, Hazardous Waste (Management, Handling and trans boundary movement) Rules, Solid Waste Management Rules, Corporate Responsibility for ENV Protection (CREP).
- Environment Management Tools: EMS – ISO 14001, Environmental Audit / Statement, Clean Development Mechanism (CDM).

Unit 5:

06

Environmental Management Plan:

- Socio economic factors, rehabilitation , compensatory afforestation , welfare measures, environmental quality , ambient air quality , green belt development , water quality , noise evels control measures ,
- Occupational health, disaster and hazard management.
- Post Project environmental monitoring programme : organisational structure , monitoring scheme, equipments required for monitoring , budgetary provision for EMP.

BVCMT503

SPECIAL CEMENTS AND APPLICATION

Course Objective:

- The course is design to familiarize the students with some special cement and application of cement.

Unit-1:

08

- Introduction to Geopolymeric cement, characteristic of fly ash, Granulated blast furnace slag, other pozzolanic materials for cement production

Unit-2:

08

- **Special Cement:** Chemical, Mineralogical and physical Characteristic of some of special cement such as -Portland Pozzolana Cement (PPC) -Portland Slag Cement (PSC) - Supersulphate Cement - Oil Well Cement - Low heat Cement - White Cement - Low Carbon Cement

Unit-3:

07

- **Performance Requirement of cement:** Concrete and mortars, introduction to various infrastructure and use of cement, Requirement of setting, strength and durability of different concrete constructions, effect of chemical composition and physical characteristic of cement on performance, fineness and particle size distribution , tailoring performance of cements.

Unit-4:

07

- Durability consideration of concrete, sulphate attacks, corrosion of reinforcing steel in concrete, attack by acid and other aggressive agencies.
- Performance of Blended Cement, advantages of Portland Pozzolana Cements(PPC) and Portland Slag Cement (PSC)

References:

- Chemistry of Cement and Concrete: F M Lea, Arnold, London
- Properties of Concrete : Neville, A.M. Longmans.
- Cement Industry Data Book, CAM , New Delhi
- World Cement Directory: CEMBUREAU

BVCMT504

MATERIAL AND ENERGY BALANCE

Course Objective:

- This course is designed such that a student can understand the problem of fluid flow, size reduction and related areas

Unit -1:

08

- Basics of material Balance, equation, with or without chemical reactions, recycle, bypass, purge calculations, Numerical on material Balances

Unit-2:

08

- Heat Capacity, Calculation of entropy changes, energy balance with chemical reactions, Heat of vaporization, heat of formation, laws of thermochemistry, heat of combustion, Heat of reaction.

Unit-3:

07

- Units and Dimensions, conversion of units, Dimensional Group and constants, Rayleigh method, Buckingham theorem, limitations, dimensionless numbers and their significances

Unit-4:

07

- Behaviour of Ideal gas, gaseous mixture, Vapour pressure, Clausius Cylaperon equation, Ideal Gas Balance, Cox Chart, Duhring's plot, Raut's law, Humidity and saturation, Relative Humidity, Humid heat, Humid volume, Dew point.
- Preparation of heat balance for pyro processing systems in cement plant

References:

1. Chemical Process Principles, Vol. I and II: Hougen, O. A., Watson, K. M. and Ragatz, Wiley/CBS, New Delhi.
2. Calculations for Chemical Engineers: Rao, Ch. Durga Prasad and Murthy, D. B. S., Process MacMillan India, New Delhi.
3. Basic principle and Calculation in Chemical Engineering: D M Himmelblau, Prentice Hall
4. Chemical Calculation: D P Tiwari, Vindra Publication.
5. Stoichiometry: Bhatt, B I and Vora S M , Tata McGraw Hill
6. Solved Example of Chemical Engineering: G K Roy: Khana Publisher

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SEMESTER-06

BVCMT601

UTILITY AND MAINTENANCE IN CEMENT PLANT

Course Objective:

- The course is designed to familiarize with cement plant utilities, maintenance and operational problems.

Unit-1:

08

- **Operational Problem:** Cause and measure to solve them, coating, ball formation, cyclone jamming, other emerging conditions, wear in cement plant- abrasion, erosion, corrosion, causes and control measures.

Unit-2:

08

- **Packing and Dispatch:** Finish grinding of clinker with gypsum and other additives, combined grinding and separate grinding packing machines, use of grinding aids, type of packing medium, tolerances, bag and bulk supply, dispatch of cement.

Unit-3:

07

- **Maintenance:** Maintenance strategies, preventive maintenance, condition monitoring for predictive Maintenance, check for kiln alignment and shell ovality, annual maintenance, shutdown Maintenance, economic life of refractories, and machineries, check lists, shutdowns, upset kiln conditions- causes and controls.

Unit-4:

07

- **Typical lay out in a cement plant related to material handling, Material Handling lay out for water:** Water supply in cement plant, requirement in plant and colonies, water for cooling and quenching, water for firefighting, water treatment.
- **Material Handling lay out for air:** Air supply to kiln system, compressed air, blowers and compressors, exhaust, pumps, Movement of materials, conveyors, F K pumps, Dense phase transport,

References:

- Cement Data Book: W. H Duda, Verlag G m Bh, Berlin
- Handbook of Material Handling
- Maintenance Engineers Hand book,
- Cement Engineers Hand Book: Labhaanand Kolhaans
- Operational Norms for cement plant: NCCBM publication

BVCMT602

MARKETING STRATEGY OF CEMENT

Course Objective:

- To have an idea of professional marketing strategy and consumer protection in cement utilization

Unit –1:

08

- **Marketing:** Definition Importance Scope
- **Marketing Management:** Tasks and Trends, Company orientations towards
- **Marketplace:** Production Concept, Product Concept, Selling Concept, Marketing Concept, Building customer value, satisfaction and loyalty, Customer Relationship Management (CRM), Analyzing marketing environment

Unit-2:

08

- Market Segmentation, Targeting and Positioning strategies; Marketing Mix; The product; Product Life Cycle and strategies;; Product Mix decisions; Branding; Packaging and Labeling

Unit-3:

07

- Pricing Decisions; Factors influencing Price five “C”s; Pricing Strategies; New product pricing; Price adjustment strategies

Unit-4:

07

- Distribution Decisions; Channel alternatives; Choice of Channel; Channel Management, Channel Dynamics, Managing promotion Mix; Advertising, Personal selling,
- Sales Promotion and publicity, Integrated Marketing Communication., Market survey of cement, Quality control of cement , Statistical analysis of quality of cement based on the data of field data.
- Marketing Control techniques; Marketing Audit; Social Marketing; Green Marketing; Web Marketing;

References:

1. Marketing Management: V.S.Ramaswamy and S.Namakumari
2. Marketing Management, MGH, New Delhi Byod Walker et..al
3. Principles of marketing management : Philip Kotler
4. Marketing Management : A strategic and decision Making Approach : John .W Mullins

BVCMT603

PROJECT AND PLANT MANAGEMENT

Course Objective:

- To have an idea of project and plant management in cement plant

Unit-1:

08

- Role of project engineering in project organisation ;Plant location and plant layout; Startup and shut downs of project; Preliminary data for construction projects; Process engineering; Flow diagram, Scheduling the project; Engineering design and drafting.

Unit-2:

08

- **Business and legal procedures Procurement operations:** Organisation and operation of a procurement department, Contract versus Commodity buying; Expediting and inspection, Procurement procedure, Project engineering and procurement.
- **Office procedure:** Conferences, Technical writing, Filing systems, Contracts and contractors: Engineering and constructors firms, The basis of contract, Ethics and the contract

Unit-3:

07

- Details of engineering design and equipment selection, Process instruments, Plant utilities, Foundations, Structures and buildings, Safety and plant design

Unit-4:

07

- **Construction planning:** Construction personnel: Jurisdictional disputes and labour relations, Construction labours distribution, Labour rates.
- **Construction operations:** Site preparation, Temporary buildings, Temporary water supply, Roadways and rail road spurs, Erection of elevated reinforced concrete structures, Erection of major equipment, final stage of construction.
- **Critical path method (cpm):** Events and activities; Network diagramming; Earliest start time and earliest finish time ;latest start time and latest finish time; Float, Advantage of CPM ;Cost to finish he projects earlier than normal cost; Precedence diagramming. Programme evaluation and review technique. Single versus multiple time estimates; Frequency distribution.

References:

- Plant design and economics for chemical engineers. Mc Graw Hill (2002). Peter S. Max & Timmerhaus
- 2."PERT AND CPM." affiliated east press pvt. Ltd., new york (1973) Srinath L. S
- 3,"Chemical engineering handbook" 7TH ed. Mc Graw Hill (1997). Perry J. H
- 4"Cost and optimization in engineering". Mc Graw Hill JELLEN F. C

BVCMT604

RENEWABLE ENERGY SYSTEM

Unit 1: **08**

- **Solar Radiation:** Extra-terrestrial and terrestrial, radiation measuring instrument, radiation measurement and predictions. Solar thermal conversion: Basics, Flat plate collectors-liquid and air type. Theory of flat plate collectors, selective coating, advanced collectors, Concentrators: optical design of concentrators, solar water heater,
- **Solar photovoltaic:** Principle of photovoltaic conversion of solar energy; Technology for fabrication of photovoltaic devices; Applications of solar cells in PV generation systems

Unit 2: **08**

- **Wind energy characteristics and measurement:** Metrology of wind speed distribution, wind speed statistics, Weibull, Rayleigh and Normal distribution, Measurement of wind data, Energy estimation of wind regimes; Wind Energy Conversion: Wind energy conversion principles; General introduction; Types and classification of WECS; Application of wind energy.

Unit 3: **07**

- **Production of biomass, photosynthesis-** C3 & C4 plants on biomass production; Biomass resources assessment; Co2 fixation potential of biomass; Classification of biomass; physicochemical characteristics of biomass as fuel Biomass conversion routes: biochemical, Chemical and thermo chemical Biochemical conversion of biomass to energy: anaerobic Digestion, biogas production mechanism, technology, types of digesters, design

Unit 4: **07**

- **Small Hydropower Systems:** Overview of micro, mini and small hydro system; Hydrology; Elements of turbine; Assessment of hydro power; selection and design criteria of turbines; site selection and civil works; speed and voltage regulation; Investment issue load Management and tariff collection; Distribution and marketing issues.
- **Ocean Energy:** Ocean energy resources, ocean energy routs; Principle of ocean thermal energy conversionsystem, ocean thermal power plants. Principles of ocean wave energy and Tidal energy conversion.
- **Geothermal energy:**Origin of geothermal resources, type of geothermal energy deposits, site selection geothermal power plants; **Hydrogen Energy:** Hydrogen as a source of energy, Hydrogen production and storage.
- **Fuel Cells:** Types of fuel cell, fuel cell system and sub-system, Principle of working, basic thermodynamics

References:

1. Kothari, Singal & Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learn
2. Khan, B H, Non Conventional Energy, TMH.
3. Sukhatme and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.
4. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application, Narosa Publeter.

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