

Faculty of Engineering & Technology

Study and Evaluation Scheme

Of

Diploma (Engineering)- 3Years

**Diploma (Engg.)- Cement Technology
II & III Year**

(Applicable w.e.f Academic Session 2013-16, till revised)



AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

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AKS University, Satna

Sherganj, Panna Road, Satna (MP) 485001

Study & Evaluation Scheme

of

Diploma (Engineering) (Cement Technology)

SUMMARY

Programme :	Diploma (CT)		
Duration :	Three year full time (Six Semesters)		
Medium :	Hindi & English Both		
Minimum Required Attendance :	75 %		
Maximum Credits:	101+48 (First Year)= 149		
Evaluation Assessment :	Internal	External	Total
	50	100	150

Internal Evaluation (Theory/ Practical Papers)

	Sessional-I	Sessional-II	Continuous Assessment & attendance
	10	10	10+20= 30
Duration of Examination :	External	Internal	
	3 hrs.	2 hrs	

To qualify the course a student is required to secure a minimum of 31% marks in aggregate including the semester end examination, internal assessment evaluation (Both theory & Practical Papers)

A candidate who secures less than 31% or Grade 'D' of marks in a Subject/Paper(s) shall be deemed to have failed in that Subject/Paper(s). In case a student has secured less than 31% or Grade 'R' in Subject/Paper(s), he/she shall be deemed to re-appear (ATKT Examination) in Subject/Paper(s) to achieve the required percentage (Min. 31%) or grade (Min. D) in the Subject/Paper(s).

Question Paper Structure

- 1. The question paper shall consist of 26 questions in three Sections. Out of which Section-A shall be of Objective type 10 questions and will be compulsory. (weightage 2 marks each).*
- 2. Section-B shall contain 10 Short answer type questions and students shall have to answer any eight (weightage 5marks each).*
- 3. Out of the remaining six question s are long answer type questions, student shall be required to attempt any four questions. The weightage of Questions shall be 10 marks each.*

Faculty of Engineering & Technology

Department of Cement Technology

Diploma (Cement Tech.)

Semester- III

TEACHING & EXAMINATION SCHEME

Subject code	Subject title	L	T	P	Credit
09CT301	Introduction Cement, Cement Raw Materials, Geology & Mining of Limestone	3	1		4
09CT302	Raw Mix Design and Chemistry of Cement	4	1		5
09CT303	Material and Energy Balance	3	1		4
09ME304	Fluid Mechanics	3	1		4
09EE305	Electrical Engineering and Electronics	4			4
09SD306	Soft Skill Development			2	1
09CT351	Testing of Cement Raw Materials Lab			4	2
09ME352	Fluid Mechanics Lab			2	1
09EE353	Electrical Engineering and Electronics Lab			2	1
	Total Credit				26

Faculty of Engineering & Technology

Department of Cement Technology

Diploma (Cement Tech.)

Semester- IV

TEACHING & EXAMINATION SCHEME

Code No.	Subject	L	T	P	Credit
09ME401	Heat and Mass Transfer	3	1		4
09ME402	Fundamentals of Thermodynamics	4	1		5
09CT403	Size Reduction and Homogenisation	4	1		5
09CT404	Pyroprocessing and Clinker Formation	4	1		5
09SD405	SSD			2	1
09CT451	Size Reduction and Homogenisation lab			2	1
09ME452	Fundamentals of Thermodynamics Lab			2	1
09CT453	Physical & Chemical Testing of cement Lab			4	2
					24

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Diploma (Cement Tech.)

Semester- V

TEACHING & EXAMINATION SCHEME

Subject code	Subject title	L	T	P	Credit
09CT501	Instrumentation and Process Control	3	1		4
09CT502	Energy Management	3	1		4
09CT503	Safety, Health and Environment	4			4
09CT504	Special Cements and Application	4			4
09CT505	Utility and Maintenance in Cement Plant	4	1		5
09CT551	Energy Management Lab			2	1
09CT552	Safety, Health and Environment Lab			4	2
09CT553	Advance Testing Method of Clinker and Cement Lab			2	1
	Total Credit				25

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Semester- VI

TEACHING & EXAMINATION SCHEME

Code No	Subject	L	T	P	Total Credit
09CT601	Marketing Strategy of Cement	3	1		4
09MT602	Project & Plant Management	4	1		5
09CT603	Performance of Cement	3	1		4
09CT651	Application of Cement Lab			2	1
09CT652	Project Work, Seminar and Comprehensive Viva				12
	Total Credit				26

Diploma (Cement Tech.)
III Semester
Introduction to Cement, Cement Raw Materials, Geology and
Mining of Limestone

Objective: he course is design to know the History of Cement, chemical and Physical characteristic of Cement Raw materials, Distribution of limestone deposits in India, Assessment of limestone deposit for cement manufacture and preliminary idea about mine planning and production scheduling of Limestone

Unit-I

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-II

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-III

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-IV

Deposit Evaluation : Prospecting and Exploration of limestone deposit, Classification of limestone deposit, Reserve Estimation, Statistical and Geostatistical evaluation, Computer Aided Deposit Evaluation.

Unit-V

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.

Text Books / Reference Books :

1. Chemistry of Cement and Concrete: F M Lea, Arnold, London
2. Cement Data Book: W. H Duda , Verlag G m Bh,Berlin
3. Chemical process control: Stephnopolous, G . PHI 199
4. Norms for limestone exploration for cement manufacture : NCCBM
5. National Inventory of cement grade limestone deposits in India : NCCBM
6. Text Book of Geology : P K Mukherjee
7. Surface Mining Technology:

Testing of Cement Raw Materials Practical

List of Experiment :

1. Physical Identification of Limestone
2. Physical Analysis of Limestone
 - a. Determination of Specific Gravity
 - b. Hardness
 - c. Compressive Strength
3. Determination of CC and MC of Limestone
 - a. Chemical analysis and determination of LOI, CaO, SiO₂, Al₂O₃, Fe₂O₃, MgO, Na₂O, K₂O, Cl of Limestone

**Diploma (Cement Tech.)
III Semester**

Raw Mix Design and Chemistry of Cement

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

Unit-I

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-II

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-III

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-IV

Mineralizer, Role of additive in clinker formation, various mineralizer and fluxes, their role in manufacture of clinker.

Unit-V

Hydration of clinker minerals, role of gypsum in cement hydration process, hydration of Portland cement and strength of Portland cement

Text Books / 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

Diploma (Cement Tech.)
III Semester

Material and Energy Balances

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

Unit-I

Basics of material Balance, equation, with or with out chemical reactions , recycle, bypass, purge calculations, Numerical on material Balances

Unit-II

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-III

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

Unit-IV

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.

Unit-V

Preparation of heat balance for pyro processing systems in cement plant.

Text Books / Reference Books :

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

Diploma (Cement Tech.)
III Semester

Fluid Mechanics

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

Unit-I

Method of Dimensional Analysis, Rayleigh's method, Buckingham's theorem, Limitation, Dimensionless number and their significance

Unit-II

Nature and properties of fluids, hydrostatic equilibrium, manometers laminar flow, viscosity, turbulences, Reynolds number, flow in conduits.

Unit-III

Equation of continuity, equation of motion, Bernoulli equation, Hagen-poiseuille equation, turbulent flow in pipes, friction factor, effect of roughness, flow through non circular cross section

Unit-IV

Motion of particles through fluid, packed and fluidised bed, flow of measurement devices

Unit-V

Properties of solids, particle size analysis, screening equipment, terminal setting velocities, setting tank, hydro cyclones, principle of separation, introduction to separation equipment.

Text Books / Reference Books :

1. Fluid Mechanics and its application: Guta, V and Gupta, S.K.
2. Element of Fluid Mechanics: Seshdri, E. V and Patankar, S. V.
3. Unit Operation Of Chemical Engineering: McCabe, W. L., Smith, J. C and Harriot, P: Tata Mcgraw Hill, New Delhi
4. Unit Operations : Brow, G. G. : CBS Publisher, New Delhi
5. Fluid Mechanics and its Applications, Gupta, V. and Gupta, S. K.,
6. Elements of Fluid Mechanics, Seshadri, E. V. and Patankar, S. V., Prentice Hall of India,

List of Experiment :

1. Measurement of water pressure in a pipe through Piezometer, different type of monometer
2. Determination of discharge through a given venturimeter and Orifice meter
3. Determination of discharge through Pitot Tube.
4. Determination of Cc, Cv, and Cd for different type of orifices and mouth pieces
5. Determination of loss of head due to sudden enlargement & friction in pipe
6. Determination of Discharge through different type of notches
7. Study of reciprocating pump
8. Study Centrifugal pump

**Diploma (Cement Tech.)
III Semester**

Electrical Engineering and Electronics

Objective: This course has been designed to know the student the basic concept of electrical engineering and about various electrical equipment used in cement plant

Unit-I

Basic Electrical Circuit analysis KVL, KCL, nodal voltage analysis, mesh current analysis, thevenin theorem, Norton theorem, Maximum power transfer theorem, Diode and their application, diode rectifier circuit, BJT, BJT Operating region and characteristics, BJT as amplifier circuit, binary number system, hexagonal number system, octal number system, binary coded decimal, logic gates, De Morgan Theorem.

Unit-II

Magnetism and electromagnetism, flux, mmf, flux density, reluctance, magnetic field intensity, permeability, 3 phase circuit, star and delta connections , 3 phase power circulation, principle of transformer operation, losses, efficiency and phasor diagram

Unit-III

D. C. Motor and Genetor, construction, and principle of operation, type of D C Machine, dynamic braking of D C Motor, losses and efficiency

Unit-IV

AC machines, synchronous generators, synchronous motor construction, types and principle of operation, 3- phase induction motor, flux and mmf phasor in induction motor, rotor frequency, emf current, power loss efficiency, reluctance motor, universal motor.

Unit-V

Power Electronics and Devices Terminal characteristics of thyristor, SCR turn on method, switching characteristics, phase control rectifier, principle of operation of chopper and inverter, electric devices, Consept of electric drive , D C Drive and A C Drive.

Text Books / Reference Books :

1. Fundamental of Electrical Engineering and Technology: William, D Stanley, John R. Hackworth, Richard L Jones.
2. Power Electronics: Dr P S Sharma

Electrical Engineering and Electronics Practical

List of Experiment

1. To draw open circuit characteristics (E to I_f) and load characteristics for a self excited DC generator
2. To draw open circuit characteristics (E to I_f) and load characteristics for a separately excited DC generator
3. To find the self and mutual inductance of a transformer
4. To perform short circuit and open circuit test for a single phase transformer and hence find the core losses and copper losses and other transformer parameters associated with it.
5. To study and plot V-I characteristic of thyristor
6. To find maximum dv/dt and di/dt limit of thyristor
7. To study the forced commutation circuit of thyristor and to find out its commutation period
8. To study different chopper circuit using thyristor.
9. Verification of thevenin theorem
10. Verification of maximum power transfer theorem

Diploma (Cement Tech.)
IV Semester
HEAT AND MASS TRANSFER

OBJECTIVE: To impart knowledge on aspects of heat and mass transfer operations in cement and manufacturing industries.

Course Content: After completion of this course, the student will be able to handle problems related to mass transfer and design and performance of heat exchangers for industries.

UNIT-I

HEAT TRANSFER BY CONDUCTION: Basic laws, steady state conduction, concept of resistance, insulation and critical radius, composite walls

UNIT-II

HEAT TRANSFER BY CONVECTION: Natural and forced convection, mean temperature difference, individual film and overall heat transfer coefficient, fins

UNIT-III

RADIANT HEAT TRANSFER: Laws, radiation between surfaces, view factors,

UNIT-IV

HEAT EXCHANE EQUIPMENT: Shell and tube heat exchanger, solid – gas heat exchange, gas – gas heat exchange,

DIFFUSION AND MASS TRANSFER BETWEEN PHASES: Diffusivity, mass transfer coefficient.

UNIT-V

EQUIPMENT FOR GAS - LIQUID OPERATIONS: Bubble columns, agitated contactors, tray towers, packed towers,

IMPORTANT MASS TRANSFER OPERATIONS: Absorption, distillation, humidification, leaching, extraction, drying, adsorption

TEXT BOOKS / REFERENCE BOOKS

1. McCabe, W. L., Smith, J. C. and Harriot, P., Unit Operations of Chemical Engineering, Tata McGraw Hill, New Delhi.
2. Brown, G. G., Unit Operations, CBS Publishers, New Delhi.
3. Kern, D. Q., Process Heat Transfer, McGraw Hill, New Delhi,
4. Treybol, R. E., Mass Transfer Operations, McGraw Hill, New Delhi

Diploma (Cement Tech.)
IV Semester
FUNDAMENTALS OF THERMODYNAMICS

Objective: The course is design to give broad perspective of basic thermodynamic principals and its laws.

UNIT -I

Introduction: The scope of thermodynamics, temperature, defined quantities; volume, pressure, work, energy, heat, Joules Experiments. The first law and other basic concepts: The first law of thermodynamics, thermodynamic state and state functions, enthalpy, the steady-state steady-flow process, equilibrium, the phase rule, the reversible process, constant-V and constant- P processes, heat capacity.

UNIT-II

Volumetric properties of pure fluids: The PVT behavior of pure substances, virial equations, the ideal gas, the applications of the virial equations, second virial coefficients from potential functions. Cubic equations of state, generalized correlations for gases, generalized correlations for liquids, molecular theory of fluids

UNIT III

Thermodynamics of flow processes ; principles of conservation of mass and energy for flow systems, analysis of expansion processes ; turbines, throttling ; compression processes – compressors and pumps ; calculation of ideal work and lost work.

Unit- IV

The second law of thermodynamics: Statements of the second law, heat engines, thermodynamic temperatures scales, thermodynamic temperature and the ideal gas scale, Entropy, Entropy changes of an ideal gas, mathematical statement of the second law, the third law of thermodynamics, entropy from the microscopic view point

UNIT V-

Refrigeration and liquefaction: The Carnot refrigerator, the vapor compression cycle, the comparison of refrigeration cycles, the choice of refrigerant, absorption refrigeration, the heat pump, liquefaction processes Thermodynamic properties of fluids: Property relations for homogeneous phases, residual properties, two phase systems, thermodynamic diagrams, tables of thermodynamic properties, generalized property correlation for gases

Text Books / Reference Books :

1. THERMODYNAMICS & AN INTRO. TO THERMOSTATISTICS (HERBERT B CALLEN)
2. Thermodynamics Engineering (D.K.Chavan & G.K. Pathak)
3. Thermodynamics (U.P. Technical University, Lucknow) R. K. Rajput

THERMODYNAMICS

List of Experiment

1. Thermal conductivity of materials,
2. Double pipe heat exchanger,
3. Shell and tube heat exchanger,
4. Heat transfer through composite walls,
5. Emissivity of Solids.
6. Diffusivity of gas,
7. Study of plate column, packed columns,
8. Study of cooling towers,
9. Tray drier,
10. Rotary drier,
- 11.** Fluidised bed drier,

**Diploma (Cement Tech.)
IV Semester**

PYROPROCESSING AND CLINKER FORMATION

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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 - I

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, their advantages and disadvantages, selection of preheaters, affect of leakages on kiln operation, optimization of kiln output, factors affecting kiln output and determination of litre weight of clinker.

UNIT - II

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

UNIT - III

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, different types of mills, ball mills, vertical roller mills, advantages and disadvantages of each operation, L/D ratio of mills, residue and moisture determination and their control, removal of fine coal from dust-laden gases, different equipments used, cyclones, bag filters and ESPs.

UNIT - IV

COOLING OF CLINKER: Different types of coolers used, their operation and control, planetary coolers; grate coolers, cooling efficiency, air requirement for cooling operation, hammer mill, drag chain, different methods of clinker cooling and their advantages, methods of clinker storage-silo and gantry

UNIT - V

REFRATORIES: Temperature profile inside kilns, functions of refractories, different types of refractories, ceramic phase diagrams, coating and ring formation

Text Books / Reference Books :

1. K. E. Perey, The Rotary Cement Kiln, Edward Arnold.
2. F. M. Lea, Chemistry of Cement and Concrete, Arnold, London.
3. H. F. W. Taylor, Cement Chemistry, Academic Press, London.
4. Bhatt, Innovations in Portland Cement Manufacturing

Diploma (Cement Tech.)

IV Semester

SIZE REDUCTION AND HOMOGENISATION

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.

Course Content: After completion of this course, a student will be familiar with these unit operations in a cement plant.

UNIT-I

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-II

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-III

Coal: Grinding & drying of coals; blending of coals; storage and handling of coals

UNIT-IV

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.

UNIT-V

Storage of Solids: Bins, silos, hoppers & feeders; storage of raw materials in piles

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

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.

Text Books / Reference Books :

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

SIZE REDUCTION LAB**LIST OF EXPERIMENTS**

1. Tests on crushing of limestone in crushers,
2. Bond's work index,
3. Study of different grinding mills,
4. Tests on cyclone air separators,
5. Simulated experiment on bed blending

Diploma (Cement Tech.)
IV Semester
PHYSICAL & CHEMICAL TESTING OF CEMENT LAB

LIST OF EXPERIMENT :

1. Physical Identification of Limestone
2. Physical Analysis of Limestone
 - a. Determination of Specific Gravity
 - b. Hardness
 - c. Compressive Strength
3. Determination of CC and MC of Limestone
 - a. Chemical analysis and determination of LOI, CaO, SiO₂, Al₂O₃, Fe₂O₃, MgO, Na₂O, K₂O, Cl of Limestone

SSD- (Soft Skills Development)

4th Semester

**B.Tech (Engg.)/ B.Tech (Ag.)/ B.Tech (BT)/ B.Sc.-Ag(Hons)/ B.Sc (BT)/ B.Pharm/ BBA (Hons) /
B.Com/B.com(Hons)/ BCA(Hons)/ B.Sc.(IT) Hons./ Diploma (Engg.)**

What is soft Skills?

The bundle of Skills which helps a person to perform a task better in a more satisfying way for both the performer and spectator (In personal, Professional and social life).

Why it is required?

To make a person to perform a task with better understanding of who, where, when, what, how and with whom a job can be executed to deliver the best expected result in perfect timing.

Learning Outcome: On completion of the course (SSD), the student should be able:

- Understand the Importance of various skills involved in developing enriching Interpersonal relationship.
- Be more aware of his/her own self- Confidence and values.
- Learn how to go about being a good team player and form an effective team.
- Understand the skills tested and participate effectively in Group discussion.
- Learn the basics of how to make an effective Presentation and have numerous practice Presentation in small groups and larger audiences.

Unit-1

Conceptual Sessions: Soft skills – a general overview, Industry Expectations, SWOT & STAR, Self Discovery, Leap to success- 7 Orientations,

Activity: Castle Plan.

Assignment : Sentence fluency assignment

Unit-2

Conceptual Sessions: Attitude, Time Management, Goal setting, Team building and leadership,

Activity: Early Bird and second mouse and Lost at Sea.

Assignment : Goal setting Assignment (Pre and Post)

Unit-3

Conceptual Sessions: Telephone etiquettes- Preparing for business calls/Making business calls/Telephonic phrases, Dining etiquettes, Email etiquettes, Corporate grooming and dressing

Activity: Role play in different scenarios/ Socialization and networking.

Assignment : Progress test on general etiquettes.

Unit-4

Conceptual Sessions: Group discussion: Introduction and definition of a GD, Purpose of a GD, Types and strategies in a GD, Do's and Don'ts in GD, Speak to Impress (Presentation skill), Anchoring in formal setting, Reading Comprehension

Activity: GD Practise and Presentation on Company profile.

Assignment : Reading Comprehension assignment.

**Diploma (Cement Tech.)
V Semester**

Instrumentation and Process control

Objective: This course is design to give the idea about the instrumentation and various process control systems in cement plant.

Unit-I

General Principles : Introduction to process control, Principle of feedback and feed forward control, introduction to dynamics of first and higher order system

Unit-II

Mode of feed back Control: On-Off, Proportional, integral, derivative control and their combination control.

Unit-III

Instrumentation: General performance and characteristics of instruments, instrumentation error, calibration, concept of stability and optimum control, Different types of sensors, transducers and measuring instruments required for process variables like temperature, pressure and flow, type of valves, role of electronic devices computer control.

Unit-IV

Measuring instruments in cement plant, Use of expert system, Fuzzy logic control, CCR operation.

Unit-V

Process control advances for cement industry (DDC/DCS/PLC/ SCADA)

Text Books / Reference Books :

8. Cement Data Book: W. H Duda , Verlag G m Bh,Berlin
9. Chemical process control: Stephnopolous, G . PHI 1990
10. Process System analysis and Control: Coughnower, McGraw Hill, 1991
11. Principle of measurement systems: Bently J P, Longmans.
12. Principle of Industrial Instrumentation: Patranabis, D, TMH

**Diploma (Cement Tech.)
V Semester**

Energy Management

Objective: The course is design to take various steps to conserve energy in cement manufacture .

Unit-I

Energy Requirement :Introduction various types of energy, requirement of thermal and electrical energy in cement manufacture, global and Indian trend of energy.

Unit-II

Energy Audit: Energy Monitoring and metering, target setting, the global trend, benchmarking, energy efficiency, plant capacity utilization, energy audit technique and advantages.

Unit-III

Thermal Energy: Heat Balance, Kiln refractory interface, lowering the losses, concept of preheating and precalcining, role of blended cements

Electrical Energy: Different electrical motors in cement plant, crushers, mills, kiln, fans, motors and drives.

Unit-IV

Energy Conservation act 2001 & 2010, Identification of Waste heat recovery

Unit-V

Case Studies: Selected 4 case studies of energy audit and energy conservation measurements in Indian Cement Plants

Text Books / Reference Books :

1. Cement Data Book: W. H Duda , Verlag G m Bh,Berlin
2. The Rotary Cement Kiln: Perey, K. E., Edward Arnold
3. Energy Management Principle- Applications, benefits, savings craigB.SmithPergamon press.
4. Guide to energy management, Barney.Lcapehart, Wayne C Tarner, William J Kennedy

List of Experiment

1. Energy conservation in rotating systems (photogate systems, pendulums).
2. Efficiency of electrical motors
3. Energy-efficient lighting: comparing incandescent bulb and compact fluorescent bulb.
4. Comparison of any two size reduction equipment
5. Studies on boilers
6. Studies on centrifugal pumps, blowers and compressors
7. Losses in pipe flow
8. Critical radius of insulation.
9. Comparison of heat losses in double pipe exchanges of two different diameters
10. Determination of calorific value of fuels (solid/liquid/gaseous fuels)

Diploma (Cement Tech.)
V Semester

Safety, Health and Environment

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

Unit-I

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-II

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-III

Air pollution Control: Emission source of CO, CO₂, NO_x and SO_x, concerns about green house 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-IV

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.

Unit-V

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)

Text Books/ Reference Books :

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 : Peavy and Rowe

List of Experiment

1. Determination of Biological oxygen demand (BOD)
2. Determination of Chemical oxygen demand (COD)
3. Measurement of Dissolved Oxygen (DO)
4. Water quality assessment.
5. Orsat analysis
6. High volume sampler
7. Spectrophotometer (Colored material concentration)
8. Study of Fire Extinguishers
- 9.** Study of safety valves, pressure relief valves etc.
- 10.** Determination of sound intensity (decibel meters)

Diploma (Cement Tech.)
V Semester

Special Cement and Application

Objective: The course is designed to familiarise the students with some special cement and application of cement.

Unit-I

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

Unit-II

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

Unit-III

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-IV

Durability consideration of concrete, sulphate attacks, corrosion of reinforcing steel in concrete, attack by acid and other aggressive agencies.

Unit-V

Performance of Blended Cement, advantages of Portland Pozzolana Cements(PPC) and Portland Slag Cement (PSC)

Text Books / Reference Books :

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

Advance Testing Method of Clinker and Cement Practical

List of Experiment :

1. Test of compressive strength of cement with standard mortar cubes.
2. X-Ray analyses of raw meal / kiln feed, Clinker
3. Mineralogical and Petrographic Analysis of
 - a. Limestone,
 - b. Clinker
 - c. Concrete

Diploma (Cement Tech.)
V Semester

Utility and Maintenance in Cement Plant

Objective: The course is designed to familiarise with cement plant utilities, maintenance and operational problem.

Unit-I

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-II

Packing and Despatch: 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-III

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-IV

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 fire fighting, water treatment.

Unit-V

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.

Text Books / Reference Books :

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

**Diploma (Cement Tech.)
VI Semester**

Marketing Strategy of Cement

Objective: To have an idea of professional marketing strategy and consumer protection in cement utilisation.

Unit-I

Marketing : Definition Importance Scope

Marketing Management : Tasks and Trends, Company orientations towards marketplace : Production Concept, Product Concept, Selling Concept, Marketing Concept, Holistic Marketing Concept, Building customer value, satisfaction and loyalty, Customer Relationship Management(CRM),

Analyzing marketing environment : Demographic, Economic , Political and Legal environment, An overview of Indian marketing environment,

Marketing mix: concept and components.

Unit-II

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

Unit-III

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

Unit-IV

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.

Unit-V

Marketing Control techniques; Marketing Audit; Social Marketing; Green Marketing; Web Marketing; green washing

Text Books:

1. V.S.Ramaswamy and S.Namakumari Marketing Management
2. Byod Walker et..al , marketing Management, MGH, New Delhi

**Diploma (Cement Tech.)
VI Semester**

Project & Plant Management

Objective: To have an idea of project and plant management in cement plant

Unit-I

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, Plot plans, Scheduling the project; Engineering design and drafting.

Unit-II

Business and legal procedures **Procurement operations:** Organisation and operation of aprocurement department, Contract versus Commodity buying; Procurement requiring engineering participation, Procurement of off-the-shelf materials, Expediting and inspection, Procurement procedure, Project engineering and procurement.Office procedure:Conferences, Technical writing, Filing systems, Contracts and contractors:Engineering and constructors firms, Selecting the contractor, The basis of contract, Type of reimbursement, The contract form, Exhibits, Overtime payments, Lump-sum contract form, Contracts and engineers, Ethics and the contract.

Unit-III

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

Unit-IV

Construction planning: Construction personnel: Jurisdictional disputes and labour relations, Construction labours distribution, Labour rates.

Construction operations: Site preparation, Driving of pile, Temporary buildings, Temporary water supply, Roadways and rail road spurs, Excavation operation, Installation of underground facilities, Electrical conduit, Foundation construction, Erection of guyed derrick, Erection of elevated reinforced concrete structures and structural steel, Erection of major equipment, Installation of piping, pipe identification, insulation, Buildings, final stage of construction.

Unit-V

Critical path method (cpm): Events and activities; Network diagramming; Earliest starttime 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.

Text Books :

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

**Diploma (Cement Tech.)
VI Semester**

Performance of Cement

Objective: To get a broad perspective of cement and concrete performance

Unit-I

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-II

Durability consideration of concrete, sulphate attacks, corrosion of reinforcing steel in concrete, attack by acid and other aggressive agencies.

Unit-III

Performance of Blended Cement, advantages of Portland Pozzolana Cements(PPC) and Portland Slag Cement (PSC)

Unit-IV

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

Unit-V

Chemical Admixtures and mineral additives : Function of admixtures, Classification of admixtures, physical requirement of admixtures, Indian standard specifications, Mineral or supplementary additives.

Text Books:

1. Chemistry of Cement and Concrete: F M Lea, Arnold, London
2. Properties of Concrete : Neville, A.M. Longmans.
3. Cement Industry Data Book, CAM, New Delhi
4. World Cement Directory: CEMBUREAU
5. Concrete Technology : M L Gambhir

Application of Cement Lab

List of Experiments:

1. Preparation of laboratory scale clinker
2. Preparation of PPC flyash based in the laboratory
3. Preparation of PSC in the laboratory
4. Performance study of PPC and PSC prepared in the lab

Diploma (Cement Tech.)
VI Semester

Project Work, Seminar and Comprehensive Viva

List of Experiment:

1. Quality control of cement manufacture
2. Pyroprocessing in cement
3. Milling system
4. EIA and EMP of cement plant
5. Process optimisation in cement manufacture
6. Use of low grade limestone in cement manufacture
7. Performance evaluation of cement and concrete