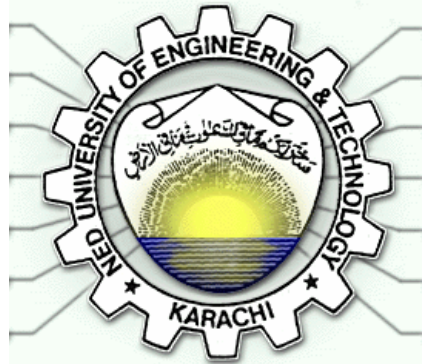


DEPARTMENT OF CHEMICAL ENGINEERING



SYLLABI OF COURSES

FOR

F.E. CHEMICAL ENGINEERING PROGRAMME

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY, KARACHI-75270
PAKISTAN

H-101	Chemical Engineering Principles
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Introduction to chemical engineering calculations, processes and process variables, Fundamentals of Material Balances, Single Phase Systems, Multiphase Systems, Energy and Energy Balances, Balances on Reactive Systems, Balances on Non Reactive Systems.

CH-102	Thermodynamics – I
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The first and second laws of thermodynamics are studied in detail. Material covered includes concepts of energy enthalpy, heat effects, conservation of energy, and interaction between heat transfer, mechanical work and chemical energy liberation, equation of state, behavior of gases and liquids and standard heat of reaction, formation and combustion. Study of combined mass and energy balances.

CH-103	Inorganic Chemistry
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Atomic structure, periodic properties, structure and bonding of covalent compounds of p block elements, Lewis structure, localized bond models, prediction of composition of binary compounds, molecular orbital model, structure and metals and ionic compounds.

Solubilities of ionic compounds, nature of solvated ions, and intermolecular Forces. Halides, oxides and hydrides of p block elements, Acids and Bases, monoprotic and polyprotic acids, titration curves, acid-base reactions, coordination compounds.

MS-111	Calculus
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Set and Functions:

Define rational, irrational and real numbers; rounding off a numerical value to specified number of decimal places or significant figures; solving quadratic and rational inequalities in involving modulus with graphical representations; Definition of set, set operations, Venn diagrams, De Morgan's laws, Cartesian product, Relation, Function and their types (Absolute value, greatest integer and combining functions). Graph of some well-known functions. Limit of functions and continuous and discontinuous functions with graphical representation.

Propositional Logic

Definition of Proposition, Statement and Argument, Logical Operators, Simple and Compound proposition, various types of connectives, Truth table, tautology, Contradiction, Contingency & Logical equivalence.

Boolean Algebra

Definition, Boolean function, duality, some basic theorems & their proofs, two valued Boolean algebra, Truth functions, Canonical sum of product form, Digital logic Gates & Switching circuit designs.

Complex Number

Argand diagram, De Moivre formula, root of polynomial equations, curve and regions in the complex plane, standard functions and their inverses (exponential, circular and Hyperbolic functions).

Differential Calculus

Differentiation and Successive differentiation and its application; Leibnitz theorem, Taylor and Maclaurin theorems with remainders in Cauchy and Lagrange form, power series. Taylor and Maclaurin series, L'Hopitals rule, extreme values of a function of one variable using first and second derivative test, asymptotes of a function, curvature and radius of curvature of a curve, partial differentiation, exact differential and its application in computing errors, extreme values of a function of two variables with and without constraints. Solution of non-linear equation, using Newton Raphson method.

Integral Calculus

Indefinite integrals and their computational techniques, reduction formulae, definite integrals and their convergence, Beta and Gamma functions and their identities, applications of integration, Centre of pressure and depth of centre of pressure.

Solid Geometry

Coordinate Systems in three dimensions, Direction cosines and ratios, vector equation of a straight line, plane and sphere, curve tracing of a function of two and three variables, Surfaces of revolutions, transformations (Cartesian to polar & cylindrical).

ME-101	Engineering Mechanics
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A) Statics:

General principles of statics, Review of vector addition and subtraction, Cartesian vectors, Position vectors, Force vector directed along a line, Dot product and cross products. Laws of triangle and parallelogram law of forces, Momentum. Conditions of equilibrium of particles, Free-body diagrams, Co-planar force systems. Moment of force, Scalar and vector formulation, Moment of a couple. Conditions of equilibrium of a rigid body in two dimensions, Free body diagrams and equations. Structural Analysis; Methods of joints and sections, Rules for Zero Force members.

B) Dynamics:

Kinematics of particles, Rectilinear and curvilinear motion of particles. Components of velocity and acceleration kinetics of particles, Newton's second law of motion, Dynamic Equilibrium, Work, Energy, Power, Impulse and momentum.

Introduction

Scientific notation and significant figures. Types of errors in experimental measurements. Units in different systems. Graphical Techniques (Log, semi-log and other non-linear graphs)

Vectors

Review of vectors, Vector derivatives, Line and surface integrals, Gradient of scalar.

Mechanics

The limits of Mechanics, Coordinate systems. Motion under constant acceleration, Newton laws and their applications. Galilean invariance. Uniform circular motion. Frictional forces. Work and Energy. Potential Energy, Energy conservation. Energy and our Environment, Angular momentum.

Electrostatics and Magnetism

Coulombs Law. Electrostatic potential energy of discrete charges. Continuous charge distribution. Gauss's Law. Electric field around conductors. Dielectrics. Dual trace oscilloscope with demonstration.

Magnetic fields. Magnetic force on current. Hall effect. Biot-Savart Law. Ampere's Law, Fields of rings and coils. Magnetic dipole. Diamagnetism, Paramagnetism and Ferromagnetism.

Semiconductor Physics

Energy levels in a semiconductor. Hole concept. Intrinsic and Extrinsic regions. Law of Mass Action. P-N junction.

Transistor. Simple circuits.

Waves and Oscillations

Free oscillation of systems with one and more degrees of freedom. Solution for Modes. Classical wave equation. Transverse modes for continuous string. Standing waves. Dispersion relation for waves. LC network and coupled pendulums. Plasma oscillations.

Optics and Lasers

Harmonic traveling waves in one dimension. Near and far fields. Two-slit interference. Huygens Principle. Single-slit diffraction. Resolving power of optical instruments. Diffraction Grating. Lasers, Population inversion. Resonant cavities. Quantum efficiency. He-Ne, Ruby and CO₂ lasers. Doppler effect and sonic boom.

Modern Physics

Inadequacy of classical physics, Plank's explanations of black body radiation. Photoelectric effect, Compton effect. Bohr theory of Hydrogen atom, Atomic spectra, Reduce mass, De-Broglie hypothesis Braggs Law, Electron microscope, Uncertainty relations Modern atomic model, Zeeman effect, Atomic nucleus, Mass energy relation, Binding energy, Nuclear forces and fundamental forces, Exponential decay and half-life. Radioactive equilibrium in a chain, Secular equilibrium, Nuclear stability, Radiation detection instruments. Alpha decay, Beta decay, Gamma decay attenuation, Nuclear radiation hazards and safety, Medical uses of Nuclear Radiation. Fission, Energy release. Nuclear Reactors. Breeder Reactor, Nuclear Fusion.

HS-101	English
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Technical Report Writing.
Preparation of Short Speeches for various occasions.

Written Communications

Writing of formal letters and applications, Drafting of Memorandums, Contracts, Advertisements and Tender notices. Preparation of Minutes of meeting. Writing short papers on technical subjects. Notes taking.

Oral Communication

Oral reporting, Conference Leading, Dictation. Interviewing, Precis Writing.
Essays on technical and non-technical subjects.

Applied Grammar

General rules for writing correct English, Punctuation, Study of words, Constructions and improvement of sentences. Vocabulary learning and use of dictionary.

HS-105	Pakistan studies
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An Outline of Emergence of Pakistan

A brief historical survey of Muslim community in the sub-continent. War of Independence 1857 and aftermath. Sir Syed Ahmed Khan, Development of Two Nation Theory. Formation of Muslim League, Lucknow Pact, Khilafat & Non-cooperation Movement, Political Events from 1924 to 1937. Pakistan Resolution --Struggle for Pakistan from 1940 to 1947. Emergence of Pakistan.

Land of Pakistan

Geophysical conditions, Territorial situation and its importance, Natural Resources: Mineral and water.

Constitutional Process

Early effects to make constitution- Problems and issues. Constitution of 1956 and its abrogation. The constitution of 1962 and its annulment. Constitutional and Political Crisis of 1971; The constitution of 1973, Recent constitutional developments.

Post Independence Development

Education in Pakistan: Planning & Development in the Field of Education. Development of Science and Technology with special reference to Engineering and Architecture. Brief survey of Pakistan's Economy; Industrial and Agricultural Development. Internal and external trade. Economic Planning and prospects.

Cultural Developments in Pakistan

Definition, Check and Contributing factors in culture, Development of Art, Philosophy and Literature.

Foreign Policy

Relations with neighbours, Super powers and the Muslim World.

Land of Pakistan

Land & People, Strategic importance, Important beautiful sights, Natural resources.

A brief Historical background

A brief historical survey of Muslim community in the sub-continent. British rule & its impacts – Indian re-action. Two nation theory– Origin & development. Factors leading towards the demand of separate Muslim state. Creation of Pakistan.

Government & Politics in Pakistan

Constitution of Pakistan – a brief outline. Governmental structure – Federal & Provincial – Local Government Institutions. Political history – a brief account.

Pakistan & the Muslim World

Relations with the Muslim countries.

Language and Culture

Origins of Urdu Language. Influence of Arabic and Persian on Urdu Language & Literature. A short history of Urdu literature.

HS-127	Pakistan studies (For Foreigners)
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Land of Pakistan

Land & People, Strategic importance, Important beautiful sights, Natural resources.

A brief Historical background

A brief historical survey of Muslim community in the sub-continent. British rule & its impacts – Indian re-action. Two nation theory– Origin & development. Factors leading towards the demand of separate Muslim state. Creation of Pakistan.

Government & Politics in Pakistan

Constitution of Pakistan – a brief outline. Governmental structure – Federal & Provincial – Local Government Institutions. Political history – a brief account.

Pakistan & the Muslim World

Relations with the Muslim countries.

Language and Culture

Origins of Urdu Language. Influence of Arabic and Persian on Urdu Language & Literature. A short history of Urdu literature.

ME-104	Workshop Practice
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Use of carpenter's tools, Exercise in preparing simple joints, Bench fitting practice, Exercise in marking and fittings; Use of measuring instruments.

Smith's forge; Exercise in bending, upsetting and swaging.

Familiarizing the students with the following processes:

Soldering and brazing, Welding, Heat treatment, Moulding and casting.

Simple machine shop processes, such as turning, shaping, milling and sheet metal work.

ME-102	Engineering Drawing
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Drawing equipment and the use of instruments; Basic drafting techniques and standards; Geometrical curves including plane curves; Cycloid; Hypocycloid and Involute.

Intersections at various positions of geometrical bodies such as prisms, pyramids, cylinders and cones: Development of surfaces of prisms, pyramids, cylinders and cones.

Freehand sketching of machine and engine components, Locking arrangements; Foundation bolts; Stuffing box; Shaft couplings; Foot step bearing; Pulleys; Engine connecting rod.

Concept of working drawing of component parts of machines and engines Size description, dimensions and specifications; Limit dimensioning and geometric tolerancing; Limits; Fits and tolerances; Conventional symbols.

Sectioning of machine and engine components; Orthographic projections and standard practices.

Isometric views with particular reference to piping and ducting.

EE-101	Electrical Technology
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Electric and Magnetic Circuits

Electric Circuits, Kirchoff's Laws, Superposition theorem, Substitution theorem. Thevenin's theorem, Norton's theorem, Rosen's theorem of star / mesh transformation, Proof for DC circuits and their application to circuit analysis, Magnetic Circuit, Series and parallel circuits, Principles of calculation of ampere turns for magnetic circuits of electromagnets, Transformers, Bipolar and multipolar DC machines Inductances in series and parallel, Hysteretic loss, Eddy current loss, Lifting power of magnet.

AC Single phase and Polyphase Systems

Single-Phase systems, Series, Parallel and series parallel circuits, J operator method and polar method. Resonance and measurement of power and power factor, Polyphase systems, Polyphase generation, Star and delta connections, Voltage and current relations, measurement of power and power factor, Balanced and unbalanced load analysis.

DC Machines

Construction, Simple lap and wave windings, Equalizing connections and dummy coils, Elementary concept of armature reaction and commutation, Cross and demagnetizing ampere

turns, DC Generator, Types, emf equation, Losses, Efficiency, Performance curves, Characteristics, Critical resistance and speed and effect of armature reaction of OCC, Internal and external characteristics from OCC neglecting and accounting armature reaction, Calculation of series ampere turns for level and over compounding. Motors, Principle, Back EMF, Torque, Speed and speed regulation, Types, Characteristics, Performance curves, Losses and efficiency, speed and torque problems involving magnetization curve, charging and ignition circuits of automobiles.

AC Synchronous Machine

Construction, Stator single layer, Double layer and concentric windings, Damping windings, Coil span factor, Distribution factor, Leakage and armature reaction, Synchronous impedance, Alternators, Types, emf equation, speed and frequency, losses and efficiency, alternator on load voltage regulation by synchronous impedance method, Synchronous Motors, Types, Principle of working, Vector diagram on load and its analysis for stator current, power factor, torque and mechanical output, Effect of variation of excitation, Losses and efficiency.

AC Induction Machines

Induction Motors, Construction, Types, Rotating field theory, Principle of working, Slip and its effect on motor current quantities, Losses, efficiency and performance curves, Starting, Full load and maximum torque relations, Torque slip characteristics.

Transformers

Construction, Principle of working, Emf equation, Transformation ratios, No load working and vector diagram, magnetizing current, Vector diagram on load, Equivalent circuit, open circuit and short circuit tests, Losses, Efficiency and performance curves, All day efficiency, Percentage and per unit R,X and Z Voltage regulation and Kapp's regulation diagram. Transformer as a mutually inductive circuit.

Converting Machines

Rotary Converters. Construction, Principle of working, Transformer connections. Voltage and current ratios of single and three phase converters, Mercury arc rectifiers, Construction, Operation, Transformer connections, Voltage and current ratios of single phase and three phase rectifiers.