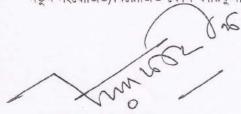সূত্র নং সদ/আইইবি/জি/অঅ-৬৫(৩)/২০১৫/৫৪১   তারিখ ঃ ০১/০৩/২০১৫ খ্রি.

অফিস স্মারক

সংশ্লিষ্ট সকলের অবগতির জন্য জানানো যাচ্ছে যে, ইঞ্জিনিয়ার্স ইনস্টিটিউশন, বাংলাদেশ (আইইবি) কর্তৃক পরিচালিত এমমআইই-এর কোর্স কারিকুলাম রিভিউ ও যুগপোযোগী করা সংক্রান্ত প্রস্তাব আইইবি কেন্দ্রীয় কাউন্সিলের ৫৭৯তম সভায় অনুমোদন করা হয়। যা এতদসঙ্গে সংযোজনী "ক" হিসাবে দেয়া হলো।

নতুন সংযোজিত/বিয়োজিত কোর্স কারিকুলামসমূহ ১ মার্চ ২০১৫ থেকে কার্যকর হবে।

প্রকৌশলী মিয়া মোহাম্মদ কাইউম
সম্মানী সাধারণ সম্পাদক

বিতরণ ঃ সদয় জ্ঞাতার্থে

১। প্রেসিডেন্ট, আইইবি
২। ভাইস-প্রেসিডেন্ট (একাডেমিক ও আন্তর্জাতিক)/(প্রশাসন ও অর্থ)/(এইচআরডি)/(এস এন্ড ড্রিউ), আইইবি
৩। সম্মানী সহকারী সাধারণ সম্পাদক (একাডেমিক ও আন্তর্জাতিক)/(প্রশাসন ও অর্থ)/(এইচআরডি)/(এস এন্ড ড্রিউ), আইইবি
৪। চেয়ারম্যান/ভাইস-চেয়ারম্যান/সম্পাদক, সকল প্রকৌশল বিভাগ, আইইবি
৫। চেয়ারম্যান/ভাইস-চেয়ারম্যান (একা. ও এইচআরডি)/(এডমিন, প্র. এন্ড এসডড্রিউ)/সম্মানী সম্পাদক, সকল কেন্দ্র, আইইবি
৬। সকল সদস্য, কেন্দ্রীয় কাউন্সিল, আইইবি
৭। চেয়ারম্যান/ভাইস-চেয়ারম্যান/সম্পাদক, সকল উপকেন্দ্র, আইইবি
৮। চেয়ারম্যান, বিপিইআরবি/বিএইটিই
৯। রেক্টর, ইএসসিবি
১০। রেজিস্ট্রার, ওএসবিবি

বিতরণ ঃ সদয় জ্ঞাতার্থে ও কার্যার্থে

১। পরীক্ষা নিয়ন্ত্রক, আইইবি
২। সম্মানী উপ পরীক্ষা নিয়ন্ত্রক, আইইবি
৩। সম্মানী সহকারী পরীক্ষা নিয়ন্ত্রক, আইইবি

বিতরণ ঃ কার্যার্থে

১। অ্যাডভাইজার
২। প্রকল্প সমন্বয়কারী, আইইবি
৩। নির্বাহী কর্মকর্তা, আইইবি
৪। আইটি এ্যাডমিনিস্ট্রেটর, আইইবি
৫। সহকারী নির্বাহী কর্মকর্তা (অর্থ ও হিসাব)/(একাডেমিক ও পাবলিকেশন), আইইবি
৬। নির্মাণ ও রক্ষণাবেক্ষন প্রকৌশলী, আইইবি
৭। নির্বাহী সহকারীবৃন্দ, আইইবি
৮। স্টেট সুপার, আইইবি
৯। কেয়ারটেকার/টেলিফোন অপারেটর, আইইবি
১০। অফিস কপি।

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Courses for AMIE, IEB
Civil Engineering

Section A

Existing	Approved
1. Engineering Mathematics	1. Mathematics - I*
2. Physics	2. Physics
3. Engineering Mechanics	3. Engineering Mechanics
4. Basic Fluid Mechanics	4. Basic Fluid Mechanics
5. Strength of Materials	5. Mathematics - II*
6. Geodesy	6. English and Economics*
7. Engineering Drawing	7. Surveying* (Renaming & Updating)
8. Engineering Materials	8. Engineering Materials
	9. Strength of Materials
	10. Engineering Drawing
	11. Chemistry *
08 (Eight) Subjects	11 (Eleven) Subjects + 40 hours of Computer Training at IEB

Section B

Existing	Approved
Compulsory:	**Compulsory:**
1. Structural Analysis	1. Structural Analysis
2. Reinforced concrete Structures	2. Reinforced Concrete Structures
3. Structural Design (4 hours Exam)	3. Structural Design (4 hours examinations)
4. Fluid Mechanics & Machineries	4. Geotechnical and Foundation Engineering* (Renaming)
5. Soil Mechanics & Foundation	5. Hydrology, Irrigation, Flood Management*
6. Computer Fundamentals	6. Computer Fundamentals
	7. Transportation and Highway Engineering*
	8. Water Supply and Sanitation Engineering*
	9. Project Planning and Construction Management*
Optional (02 out of 08):	**Optional (02 out of the following):**
1. Steel Structures	1. Design and Steel Structures (Renaming)
2. Hydrology	2. Railway and Airport Engineering
3. Highway Engineering	3. Soil Dynamics and Earth Retaining Structures*
4. Railway and Airport Engg.	4. Open Channel Hydraulics and River Training*
5. Sanitary & Water Supply Engg.	5. Solid and Hazardous Waste Management*
6. Techniques and Management of Building Construction	6. Professional Practices and Communications*
7. Irrigation, Flood Control & Drainage	7. Socio-economic Aspects of Development Projects*
8. Dock and Harbour Engineering	8. Engineering Geology and Geomorphology*
08 (Eight) Subjects	11 (Eleven) Subjects + 3 months of Industrial Attachment

* New subjects approved. Detailed syllabus is enclosed.

Courses for AMIE, IEB
Electrical and Electronic Engineering

Section A

Existing	Approved
1. Engineering Mathematics	1. Mathematics - I*
2. Physics	2. Physics
3. Engineering Mechanics	3. Basic Fluid Mechanics
4. Basic Fluid Mechanics	4. Mathematics - II*
5. Thermal Engineering	5. English and Economics*
6. Elementary Electrical Engineering	6. Thermal Engineering
7. Elementary Electronics	7. Elementary Electrical Engineering
8. Properties and Mechanics of Materials	8. Elementary Electronics
	9. Engineering Drawing
	10. Properties and Mechanics of Materials
	11. Chemistry *
08 (Eight) Subjects	11 (Eleven) Subjects + 40 hours of Computer Training at IEB

Section B

Existing	Approved
Compulsory:	**Compulsory**:
1. Electrical Machines	1. Energy Conversion and Electrical Machines*
2. Transmission & Distribution of Electrical Power	2. Electric Transmission & Distribution System*
3. Semiconductor Devices	3. Electronic Circuit Analysis*
4. Network Analysis	4. Network Analysis
5. Measurement & Instrumentation	5. Measurement & Instrumentation
6. Computer Fundamentals	6. Computer Fundamentals
	7. Industrial Administration & Management
Optional (02 out of 08):	**Optional (04 out of the following)**:
1. Telecommunication Engineering	1. Communication System*
2. Advanced Electronics	2. Power and Industrial Electronics*
3. Switch Gear and Protective Devices	3. Power System Protection*
4. Electromagnetic Theory	4. Electromagnetic Theory
5. Power Station	5. Biomedical Instrumentation*
6. Power System Analysis	6. Power System Analysis
7. Microwave Engineering	7. Digital Electronics*
8. Control System	8. Control System
	9. Microprocessors & Microcontrollers*
	10. Power Station*
08 (Eight) Subjects	11 (Eleven) Subjects + 3 months of Industrial Attachment

Courses for AMIE, IEB
Mechanical Engineering

Section A

Existing	Approved
1. Engineering Mathematics	1. Mathematics - I*
2. Physics	2. Physics
3. Engineering Mechanics	3. Engineering Mechanics
4. Basic Fluid Mechanics	4. Basic Fluid Mechanics
5. Heat and Mass Transfer	5. Mathematics - II*
6. Basic Electrical Engineering	6. English and Economics*
7. Engineering Drawing	7. Basic Electrical Engineering
8. Science of Materials	8. Engineering Drawing
	9. Strength of Materials
	10. Science of Materials
	11. Chemistry *
08 (Eight) Subjects	11 (Eleven) Subjects
	+ 40 hours of Computer Training at IEB

Section B

Existing	Approved
Compulsory:	**Compulsory:**
1. Industrial administration & Management	1. Industrial Administration & Management
2. Applied Thermodynamics	2. Heat and Mass Transfer
3. Machine Design (4 hours Exam)	3. Engineering Thermodynamics*
4. Manufacturing Process	4. Machine Design (4 hours examinations)
5. Theory of Machine	5. Instrumentation & Control Engineering
6. Computer Fundamentals	6. Manufacturing Process
	7. Computer Fundamentals
Optional (02 out of 08):	**Optional (04 out of the following):**
1. Machine Tool	1. Machine Tool
2. Inspection & Quality Control	2. Inspection & Quality Control
3. Power Plant Engineering	3. Power Plant Engineering
4. Refrigeration & Airconditioning	4. Refrigeration & Airconditioning
5. Automobile Engineering	5. Automobile Engineering
6. Fluid Mechanics & Machineries	6. Fluid Mechanics & Machineries
7. Production Planning & control	7. Production Planning & control
8. Instrumentation & Control Engineering	8. Theory of Machine
	9. Internal Combustion Engines*
	10. Renewable and Non-Conventional Energy.*
	11. Nuclear Engineering*
08 (Eight) Subjects	11 (Eleven) Subjects
	+ 3 months of Industrial Attachment

Courses for AMIE, IEB
Chemical Engineering
Section A

Existing	Approved
1. Engineering Mathematics	1. Mathematics - I*
2. Physics	2. Physics
3. Engineering Mechanics	3. Physical Chemistry*
4. Basic Fluid Mechanics	4. Mathematics - II*
5. Applied Chemistry	5. English and Economics*
6. Basic Electrical Engineering	6. Properties and Mechanics of Materials
7. Engineering Drawing	7. Basic Electrical Engineering
8. Properties and Mechanics of Materials	8. Chemical Engineering Thermodynamics*
	9. Basic Fluid Mechanics & Heat Transfer*
	10. Engineering Drawing
	11. Industrial Stoichiornetry
08 (Eight) Subjects	11 (Eleven) Subjects + 40 hours of Computer Training at IEB

Section B

Existing	Approved
Compulsory:	**Compulsory:**
1. Unit Operation Practices	1. Mass Transfer*
2. Industrial Stoichiornetry	2. Unit Operation Practices
3. Process Design (4 hours Exam)	3. Kinetics & Reactor Design
4. Heat. Mass & Momentum Transfer	4. Process Control & Instrumentation*
5. Chemical Engineering Thermodynamics	5. Process Design (4 hours examinations)
6. Computer Fundamentals	6. Chemical Engineering Economics & Management
	7. Chemical Plant Equipment Design*
Optional (02 out of 08):	**Optional (04 out of the following):**
1. Kinetics & Reactor Design	1. Chemical Plant Safety*
2. Mathematical and Computational Methods in Chemical Engineering	2. Corrosion and Materials of Construction*
3. Corrosion	3. Transport Phenomena
4. Chemical Engg. Economics & Management	4. Project Engineering*
5. Fuel Technology	5. Energy and Environment*
6. Fertilizer, Pulp and Paper Technology	6. Fertilizer Technology & Pulp and Paper Technology*
7. Process Control	7. Natural Gas and Refinery Engineering
8. Natural Gas & Refinery Engineering	8. Food and Sugar Technology*
	9. Polymer Materials and Technology*
	10. Fuel Technology*
08 (Eight) Subjects	11 (Eleven) Subjects + 3 months of Industrial Attachment**

** Design Project under the supervision of an engineer working in an industry or in a design company for twenty years; or under a professor of relevant Engineering in Bangladesh. Format for the project shall be provided by IEB. The project proposal and its supervisor shall be approved by the concerned committee of IEB. The work will involve about 120 man-hours and it will be presented to the concerned committee.

** Procedure for forming the Committee is to be worked out.

For whom to be implemented

The Rules and Syllabus of AMIE examinations will be implemented for the students

    (i)   who have been admitted in February 2014.

    (ii)   who have been admitted in August 2014 & onwards.

    (iii)   who have been admitted before February 2014 but have not passed in 4 (four) or more subjects in the Section "A".

Rules/Conditions to be followed

Rules 15 and 17 of Rules and Syllabus of AMIE (revised on 2011) are to be amended as under:

Existing:	Approved
15. Candidates willing to appear in Section 'A' Examination will be required to appear in 8 (eight) subjects as given below. They may, however, appear in one or more papers in any examination.	15. (a) Candidates willing to appear in Section 'A' Examination will be required to appear in 11 (Eleven) subjects as given below branch wise. (b) They may appear in one or more subjects in any examination, however, no student will be allowed to appear in more than 4 (four) subjects in any examination. (c) The students will be required to undertake a Computer Training in addition to the requirements in (a).
17. Candidates willing to appear in Section 'B' Examination will be required to select any one of the following four branches of engineering. Candidates will be required to appear in 8 (eight) subjects: 6 (six) compulsory and 2 (two) optional. They may, however, appear in one or more papers in any examination. No. of total subjects required: 8 (eight).	17. (a) Candidates willing to appear in Section 'B' Examination will be required to select any one of the following four branches of engineering. Candidates will be required to appear in 11 (eleven) subjects. (b) They may appear in one or more subjects in any examination. However, no student will be allowed to appear in more than 4 (four) subjects in any examination. (c) The students will be required to undergo an industrial attachment in addition to the requirements in (a).

Appendix

Syllabus of New proposed subjects

Mathematics -I

Differential calculus: Differentiation of explicit and implicit functions and parametric equations, successive differentiation of various types of functions. Leibnitz's theorem, Rolle's theorem, mean value theorem. Taylor's theorem in finite and infinite forms, Maclaurin's theorem in finite and infinite forms. Lagrange's form of remainder, Cauchy's form of remainder. Expansion of function by differentiation and integration. Partial differentiation. Euler's theorem. Tangent an normal, subangent and subnormal in cartesian and polar coordinates. Determination of maximum and minimum values of functions points of inflexion, its applications. Evaluation of indeterminate forms by L'Hospital's rule. Curvature, radius of curvature, centre of curvature and chord of curvature. Evolute and involute. Asymptotes envelopes. Curve tracing.

Three dimensional coordinate geometry: System of coordinate, distance between two points, section formula, projections, direction cosines, equations of planes and lines.

Vectors Definition of vectors, equality of vectors, addition and multiplication of vectors, triple product and multiple products, application to geometry and mechanism, linear dependence and independence of vectors.

Mathematics -II

Integral calculus : Definitions of integrations, integration by the method of substitution, integration by parts, standard integrals, integration by the method of successive reduction. Definite integral its properties and use in summing series. Walli's formulae. Improper integral, beta function and gamma function. Area under a plane curve in cartesian and polar coordinates, area of the region enclosed by two curves in cartesian and polar coordinates, trapezoidal rule. Simpson's rule. Arc lengths of curves in cartesian and polar coordinates, parametric and pedal equations, intrinsic equation. Volumes of solids of revolution, volume of hollow solids of revolution by shell method, area of surface of revolution.

Differential equations : Convergence and divergence of infinite series. Ordinary differential equation-formation of differential equations, solution of first order differential equations by various methods. Solutions of general linear equations of second and higher order with constant coefficients. Solutions of homogeneous line equations, applications.

Solutions of differential equations of the higher order when the dependent and independent variables are absent. Solution of differential equation by the method based on the factorization of the operators.

English and Economics

Grammatical Problems. Reading and Writing Skill. Vocabulary. Technical and Scientific Presentation. Report Writing and Note Taking.

Microeconomics: Theory of demand and supply and their elasticities. Application of economic theories to the problems of developing countries. Concepts of market and market structure.

Macroeconomics: Savings, investment, employment. National Income, GDP and GNI. Calculation of Nominal and Real GDP. Tax. Inflation. Monetary policy. Fiscal policy and Trade policy with reference to Bangladesh. Balance of payments.

Surveying

Reconnaissance survey; linear measurements; traverse survey; triangulation, leveling and contouring; calculation of areas and volumes; problems on heights and distances; curves and curve ranging, transition curve, vertical curves; tacheometry: introduction, principles and problems on tacheometry; astronomical surveying: definition, instruments, astronomical corrections, systems of time; photogrammetry: introduction of terrestrial photography, aerial photography, reading of photo mosaic, scale; project surveying; errors in surveying; remote sensing; introduction to geographic information system (GIS) and global positioning system (GPS).

Hydrology, Irrigation and Flood Management

Hydrologic cycle; hydrologic measurement: precipitation, evaporation and stream flow; hydrographs; plant-soil-water relationship; consumptive use and estimation of irrigation water requirements; methods of irrigation; quality of irrigation water; problems of irrigated land; drainage and its principles and problems; flood and its causes and management.

Transportation and Highway Engineering

Introduction to transportation engineering; elements and modes of transportation system; transportation systems planning concepts; transportation system in Bangladesh: road classification and design standards; highways: highway types; bypass roads; intersections; geometric design of highways; traffic characteristics, traffic studies and traffic control devices; road safety and accident studies; pedestrians and NMT issues; parking and roadway lighting; highway materials; design, construction and maintenance of low cost pavements, rigid pavements and bituminous pavements.

Water Supply and Sanitation Engineering

Introduction to environmental engineering; water supply: water requirement, water sources, water quality; treatment and distribution systems, design concepts of water treatment plants; waste water engineering: wastewater characteristics, treatment and disposal, on site sanitation systems; solid waste management. Introduction to environmental pollution; water, air, soil and noise pollution; effects of pollution. Environmental quality standards; introduction to environmental impact assessment.

Project planning and Construction Management

Project planning and evaluation; feasibility reports; cash flows, pay back period, internal rate of return; benefit-cost ratio; cost-benefit analysis case studies; Planning and scheduling, PERT, CPM; resource scheduling; linear programming and application. Principles of management; construction management: principles, project organization, methods and practices, technology, management of materials and equipment, site management, contracts and specifications, inspection and quality control, safety, economy. Psychology in administration: human factors in management. Demand forecasting; inventory control; stores management; procurement.

Soil Dynamics and Earth Retaining Structures

Elementary vibrations; dynamic properties of soil; seismic response of soils: site effects, site amplification and liquefaction; remedial measures for earthquake hazards. Rigid and flexible earth retaining structures; design and methods of construction: dewatering and slurry-wall construction, braced excavation, sheet piles, cofferdams.

Open Channel Hydraulics and River Training

Open channel flow and its classification; velocity and pressure distributions; energy and momentum equations; transition problems and critical flow; concept of uniform flow, computation of uniform flow; hydraulic jump; gradually varied flow profiles; design of channels; river training and bank protection; navigation and dredging.

Solid and Hazardous Waste Management

Solid Waste Management: sources and types of solid wastes; physical and chemical properties of solid wastes; solid waste generation; onsite handling, storage and processing; collection of solid wastes; transfer stations and transport; ultimate disposal methods; resources and energy recovery and recycling; industrial solid waste collection and disposal. Hazardous Waste Management: identification, sources and characteristics of hazardous wastes; hospital waste management practices; legal aspects; auditing and prevention; methods of treatment and disposal – physical, chemical, biological and thermal treatment; stabilization and solidification, engineering storage, incineration, landfill and deep burial.

Professional Practices and Communication

Project, its characteristic feature, project life cycle; type of contracts; procurement regulations and law; documents for procurement of works, goods and services and their application; contract risk and contract responsibility; insurances; tender procedure; claims, disputes and arbitration procedure; measures for reducing fiduciary risks. Introduction to communication concepts, modes of communication, methods of effective communication; writing reports; oral presentation of reports; writing proposals; preparing effective business messages; conducting meetings; strategies for effective speaking and successful inter personal communication; job application process, interviews and follow-ups; an introduction to the code of ethics for engineers.

Socio-economic Aspects of Development Projects

Economics and social structure; development and economic growth; socio-economic indicators; concept of human development, human development index; gender related human development index; human poverty and human poverty index; poverty reduction strategies in Bangladesh; concepts of sustainable development; MDGs. Characteristics of development projects; human interest related aspects; population displacement; resettlement and rehabilitation strategy; Productivity; land loss, land use and land ownership patterns; fisheries and aquaculture; deforestation and afforestation; communication, commerce, industries and other economic benefits; water supply, sanitation, health and nutrition; inequalities in distribution of benefits and losses; Socio-economic impact assessment approach; socio-economic survey; case studies.

Engineering Geology and Geomorphology

Minerals; identification of minerals, common rock forming minerals; physical properties of minerals; mineraloids rocks; types of rocks, cycle of rock change; earthquake and seismic map of Bangladesh.
Structural geology; faults; types of faults; fold and fold type; domes; basins; erosional process; quantitative analysis of erosional land forms. Channel development; channel widening; valley shape; stream terraces; alluvial flood plains; deltas and alluvial fans; channel morphology; channel patterns and the river basin; geology and geomorphology of Bangladesh.

Power System Protection

Purpose of power system protection. Criteria for detecting faults : over current, differential current, difference of phase angles, over and under voltages, power direction, symmetrical components of current and voltages, impedance, frequency and temperature. Instrument transformers: CT and PT. Electromechanical, electronic and digital Relays: basic modules, over current, differential, distance and directional. Trip circuits. Unit protection schemes: Generator, transformer, motor, bus bar, transmission and distribution lines. Miniature circuit breakers and fuses. Circuit breakers: Principle of arc extinction, selection criteria and ratings of circuit breakers, types - air, oil, SF6 and vacuum.

Electronic Circuit Analysis

Diodes : current-voltage characteristics, piecewise linear model, constant voltage model, rectifier circuits, voltage regulator circuits. MOSFETS ; principle of operation of MOSFETs, DC biasing circuits, small signal analysis, currents in non-saturation and saturation regions, amplifiers using MOSFETs, MOSFET inverter. BJT Switching and Amplifiers: principle of operation of BJT, currents in different regions of operation, DC biasing circuits, small signal analysis, amplifiers and switching circuits, Operational Amplifiers: ideal OPAMPs, summer, integrator and differential circuits. Oscillators : positive feedback, different types of oscillators, Power Amplifiers: Class A, class B and class AB amplifiers.

Energy Conversion and Electrical Machines

Energy conversion: Force in a capacitor, the toroid, magnetic materials, iron and air, flux linkage and equivalent flux, energy stored in magnetic circuits, magnetic force and hysteresis loop. Inductance, force and torque, mutual inductance, energy, torque and force in inductively coupled circuits, complex power. The Transformer: Two winding transformer, ideal two widding transformer, current components, transformer tests, losses and efficiency calculation, voltage regulation and parallel operation. Auto and instrumentation transformers, three phase transformer connections. Induction motors-theory of operation, equivalent circuit, slip-torque relationship, losses and efficiency, speed control and starting methods. DC machines: construction, generator and motor principle, types and characteristics. Alternator (AC Generator): induced armature voltage, phasor diagram, OCC and short circuit tests, voltage regulation, parallel operation, real and reactive power versus power angle. Operation of a synchronous motor, v curves slip tests.

Electric Transmission and Distribution Systems

Transmission System: Alternate Current (AC) vs Direct Current (DC) transmission, overhead vs underground transmission, selection of voltage levels, conductor selection, routing, insulation design, sag and spacing calculations, design of towers and cross arms, shielding wires, corona and corona power loss, radio and television interference, environmental impact of high voltage transmission, electrical performances, compensation, and cost analysis. Distribution System Design: Residential and industrial distribution; Types of distribution system. Connected loads, load factor, maximum demand, diversity factors, Distribution transformer sizing, substation design, selection of cables, cable current carrying capacity, derating factors, effect of harmonics, voltage drop calculations, short circuit calculations, fuses and coordination of fuses.

Power System Analysis (Updated)

Requisite: Energy Conversion and Electrical Machines.

Introduction, review of phasor and three phase power, Transmission-line parameter computation and transmission-line modeling, Transformer, generator, and load modeling, Power flow analysis, Generation control, economic dispatch and restructuring, Transient stability, Short circuit analysis, including symmetrical components, System protection.

Microprocessor and Microcontroller

Introduction to microprocessors, 8-bit to 32-bit processors, Intel 8086 microprocessor: Architecture: Registers and controls, ALU, BIU, address computation and addressing modes Assembly language programming: Instruction sets and program constructs, assembler, linker and cross assemblers. Interrupt structure and operations. Interfacing microprocessors with peripheral devices: I/O devices, interfacing with A/D converters, programmable timer, serial communication interface, programmable interrupt controller, direct memory access, keyboard and display interface, sample program constructs. Microcontrollers: MCS-51 microcontroller, architecture, special function registers, pin functions, programming concepts.

Power and Industrial Electronics

Power semiconductor switches and triggering devices: BJT, MOSFET, SCR, IGBT, GTO, TRIAC, UJT and DIAC. Rectifiers: Uncontrolled and controlled single phase and three phase. Regulated power supplies: Linear-series and shunt, switching buck, buck-boost, boost and Cuk regulators. AC voltage controllers: single and three phase. Choppers. DC motor control. Single phase cycloconverter. Inverters: Single phase and three phase voltage and current source. AC motor control. Stepper motor control. Resonant inverters. Pulse width modulation control of static converters. Programmable logic controller (PLC), Microcontroller, sensors and displays.

Communication Systems

Introduction to communication systems, signals and spectra, communication channels, amplitude modulation and demodulation, frequency modulation and demodulation, frequency division multiplexing. Sampling theory, pulse modulation and demodulation, quantization, companding, pulse code modulation (PCM), delta modulation, differential PCM. Time division multiplexing. Digital modulation schemes: ASK,PSK, FSK, MSK, DPSK, M-ay modulations, match filter and correlation receivers. Line coding, inter symbol interference, Nyquist wave shaping, eye pattern, adaptive equalization. Transmission over band pass channel. statistical properties of noise and random signals, band pass representation of noise, probability of error calculation, error rates in binary and M-ary transmission. Introduction to ATM, SDH, SONET and optical communications.

Digital Electronics

Unsigned number systems including decimal, binary, octal, hex and base conversion, Codes - BCD, Gray, ASCII and parity, Basic digital logic gates (AND / OR) and truth tables. Boolean Algebra: Postulate and theorems, equation reductions and circuit implementations. DeMorgan's theorems: NAND and NOR gates and implementation. Sum of Product circuits, Karnaugh map and circuit simplification, Multiplexers, demultiplexers, decoders and other MSI circuits, Basic SR Flip-Flops - NAND & NOR implementations and limitations, D Latch, Clocked and Edge Triggered D Flip-Flops, Edge Triggered JK Flip-Flop, One Shot Multivibrators and 555 type timers, Ripple Counter, Sequential Logic - Synchronous Counters, Shift Registers and basic State Machine concepts, Memory Systems - RAM, ROM, PROM, EPROM etc., Programmable Logic - an extension of the PROM - PAL, PLA and other PLD devices. FPGAs.

Biomedical Instrumentation

Medical terminology. General diagnostics. Electrophysical methods like ECG, EEG, EMG, defibrillator and pacemaker. Measurement techniques for respiration and circulation. Methods for intensive monitoring, clinical/chemical measurement techniques. Disinfection/sterilisation, sensors. Imaging techniques: X-rays, nuclear medicine, ultrasound, magnetic resonance.

Supporting instrumentation like incubator, respirator, anaesthesia machine and dialysis machine. Surgical techniques with diathermy and laser.

Internal Combustion Engines

Introduction: basic engine types, their operation and testing; Idealized cycles and processes; Fuels: IC engine fuels, their properties and tests: Combustion: SI engine, CI engine and gas turbines; Equilibrium charts; Exhaust gas analysis and air pollution; Fuel metering: SI engines, CI engines; Air capacity of engines: two and four stroke cycles, naturally aspirated and supercharged; Performance and design: performance of unsupercharged engines and supercharged engines, design considerations, application of principle of similitude in engine design.

Compressors and turbines: compression processes, volumetric efficiency, multistage compression, intercooling; Various types of compressors and gas turbines.

Renewable and Non-Conventional Energy

Reserves of non-renewable fuels; Prospects of renewable energy, and its sources and pattern of usage; characteristics of renewable sources: intermittent, low power density etc.; use of renewables in small scale systems;

Current technology: wind wave, tidal, passive and active solar, biological and examples of devices; Energy management, interaction of non-technical requirements (social, economic, political, environment) in engineering design arid innovation; case-study.

Engineering Thermodynamics

Basic definitions and concepts of thermodynamics; Energy, energy transfer, and general energy analysis; Properties of pure substances-ideal and non-ideal gases, and equations of states; First law of thermodynamics – mass and energy balances in open and closed systems; Second law of thermodynamics – entropy and analysis of control volume, irreversibility and availability; Relations of thermodynamic properties; Analysis of power and refrigeration cycles – detailed treatment of gas and vapour cycles including gas and steam cycles, refrigerating cycles and cryogenics; Mixtures of ideal gases and vapours; Psychrometry.

Nuclear Engineering

Properties of nuclei, nuclear structure, radioactivity, nuclear reactions, fission, resonance reactions, moderation of neutrons; Fission and fusion processes, radioactivity, biological effects, radiation and thermal releases – neutron attenuation, scattering and moderation; Nuclear reactors; Nuclear power systems - reactor energy removal; Reactor kinetics and reactor controls; Radiation does and shielding; Reactor safety; Nuclear waste management; Radioactivity release and consequences.

Physical Chemistry

Types of Solution. Solubility.Thermo-chemistry. Second law of thermodynamics and its applications. Chemical equilibrium of homogenous and heterogeneous reactions. Thermodynamic treatment of equilibrium constant. Ionization of water and pH. Adsorption and adsorption isotherm. Catalysis and Catalysts.Phase equilibria:Phase rule and its application. Electrochemical cells.

Chemical Engineering Thermodynamics

The scope of thermodynamics: fundamental quantities; secondary quantities. The first law of thermodynamics and other basic concepts. The thermodynamic state and state function; extensive and intensive properties; enthalpy; steady state flow process, phase rule, reversible and irreversible processes. PVT relations.The second law of thermodynamics, concepts of entropy changes and irreversibility. The third law of thermodynamics. Conversion of heat into work by power cycles, vapor cycles, steam power plants. Refrigeration and liquefaction; Carnot refrigeration cycle, air-refrigeration cycle, vapor-compression cycle, absorption refrigeration, heat pump; liquefaction process.

Basic Fluid Mechanics and Heat Transfer

Fluid statics and manometry; Concept of shear stress and classification of fluids. Flow of fluids in closed conduits: laminar and turbulent flow, friction factor and frictional losses in pipes and fittings, expansion-contraction losses.Pipeline with pumps and turbines. Flow measurements. Dimensional analysis. Macroscopic balances and its applications. Classification of pumps and characteristics of pumps.

Modes of heat transfer. Conduction, convection and radiation processes. Steady and unsteady heat conduction. Convective heat transfer process. Heat transfer with phase change, condensation and boiling. Types of heat transfer equipment, LMTD, Thermal and mechanical design of heat transfer equipment, TEMA standards. Evaporators.

Mass Transfer

Mass transfer process. Phase equilibria. Equilibrium stage concept. Solvent extraction: liquid-liquid extraction in single and multiple contact extractor with completely immiscible and partially miscible solvents. Use of triangular diagram for stage calculations: batch and continuous leaching and washing of solids.

Binary distillation: equilibrium flash and differential distillation; batch and continuous distillation with reflux, use of enthalpy concentration diagram and simplified methods for stage calculations. Multicomponent distillation: simplified methods for stage calculation. Gas-liquid absorption: analytical and graphical methods for stage calculations. Mass transfer coefficients. Continuous contact mass transfer packed and spray columns. Membrane separation process. Adsorption principles: industrial applications with emphasis on ion-exchange and pressure swing adsorption.

Transport Phenomena

Application of shell balances equations of change for momentum, energy and mass transfers. Laminar and turbulent flows. Multi-component systems, analogy equations relating momentum, energy and mass transfer.

Process Control and Instrumentation

Basic concepts of chemical process control: design aspect and hardware elements. Transfer functions and input-output models. Linearization of non-linear systems. Dynamic and static behavior of chemical processes: first, second and higher order processes, transportation lag, systems in series. Concept of feedback control, feedback controllers and final control elements; block diagrams; closed loop responses, concepts of stability and stability testing. Frequency response analysis: Bode diagram; Nyquist plot; Bode and Nyquist stability criteria.

Feed forward and ratio control: adaptive and inferential control. Design of control systems for multivariable processes. Design of control systems of complex plants.

Controller mechanism, measuring instruments and sensors, transducers, transmitters and control elements.

PLC and DCS in chemical process plants.

Fertilizer and Pulp and Paper Technology

Classification of fertilizers and their applications. Fertilizer industries in Bangladesh. Nitrogen fertilizer: ammonia, urea, raw materials, manufacturing processes, design considerations, production processes, waste disposal methods. Production of other nitrogen fertilizers.

Phosphate fertilizer production: raw materials, manufacturing processes of sulfuric acid and phosphoric acid; production and comparative economics of triple superphosphate, ammonium phosphate and other fertilizers from phosphoric acid. Complex fertilizers; nitrophosphate. Manufacturing process of different potash fertilizer. Compound fertilizers and their economics.

Introduction to pulp and paper industries. Types of raw materials. Compositions and chemical properties of wood. Preparation of raw material for pulping: mechanical and semi chemical pulping. Different processes of chemical pulping and their chemistry. Digestion of pulp, Chemical recovery and energy balances, Bleaching. Beating and Sizing. Paper making. Recycle paper and its manufacturing in Bangladesh. Waste disposal. Technical auditing.

Chemical Plant Equipment Design

Chemical process plant equipment: static and rotary. Applicable codes and standards covering design, materials, fabrication, stage quality control, performance testing. Design of cylindrical columns and tanks. Stress analysis. Material selection. Non-destructive tests and inspection.

Chemical Plant Safety

Introduction to occupational health and hygiene. Industrial safety legislation. MSDS. Toxicity and TLV, explosion and flammability. Hazard identification and precautions. Dow F and E index, Mond-Dow index, hazard operability studies. Hazard analysis, safety check lists. Working environment requirements. Safety problems to specific processing plant including nuclear installation. Accident Investigation. Safety Audit.

Corrosion and Materials of Construction

Engineering requirements of material; inter-atomic attractive forces; the arrangement of atoms in materials, metallic phases and their properties: ceramic phases and their properties, organic materials (polymers) and their properties, Multiphase materials. Equilibrium relationship, phase diagrams, Fe-C phase diagram. Modification of properties through changes in microstructure, heat treatment. Corrosion-definition and importance, electrochemical mechanisms, corrosion tendency and electrode potentials, polarization and corrosion rates, passivity, Pourbaix diagram behavior of iron and steel.

Effect of stress, atmospheric corrosion, soil corrosion, oxidation and high temperature corrosion, stray current corrosion. Cathodic and anodic protection; metallic, inorganic and organic coatings, inhibitors and passivators, boiler corrosion and water treatment. Corrosion resistance of metals and alloys. Stainless steels, copper and copper alloys, aluminum, magnesium, lead nickel and nickel alloys, Ti. Zr, Ta, Si-Fe and Si-Ni alloys; industrial environments and appropriate materials. Economies of corrosion protection.

Project Engineering

Chemical Engineering Project. Definition of a project, Technical specification, Design Basis, Process Licensing. Procurement, General Contractors, vendors and sub-contractors. Codes, standards and engineering specifications, Review and approval of engineering documents, Inspection, Mechanical completion, start-up and commissioning, performance tests, Contract negotiation. Documentation of project.

Energy and Environment

Energy situation and sources in Bangladesh. Energy Policy. Energy Regulatory Commission. Energy consumption pattern in Bangladesh. Energy conservation and auditing. Pricing policy and mechanism. Costing techniques, financial appraisal and profitability. Renewable energy and its prospects in Bangladesh. Energy security.

Environmental Systems. Environmental legislations and regulations in Bangladesh. EIS and EIA. Emission standards (gaseous, liquids and solids). Environmental auditing. International initiatives for environment protection. Air and water pollution. Noise pollution Environmental disaster management.

Natural Gas and Refinery Engineering

Introduction to the natural gas industry, properties of reservoir rock, phase behavior of natural gas systems, properties of natural gasses and volatile hydrocarbon liquids, water-hydrocarbon systems, measurement and computation, gas-flow measurement, drilling and testing of nature gas wells, steady and unsteady state flow in reservoirs, development and operation of gas fields, fields separation and oil absorption processes, fractional distillation and temperature pressure-absorption processes, fractional distillation and low-temperature processing, dehydration and sweetening of natural gas, storage of natural gas, transmission to market.

Introduction to petroleum refining, evaluation of crude oils, refinery products and their uses, analysis of petroleum products. Refining processes; atmospheric and vacuum distillation, thermal cracking, coking, pyrolysis, catalytic cracking, hydro-cracking, catalytic reforming, hydrogen treating, isomerization, alkylation,and desulfurization. Production of lubricants and greases, Bitumen production. Discussion on ERL with emphasis on processing.

Food and Sugar Technology

Introduction to food technology. Principles of major preservation methods: drying, chemical, thermal, low temperature freezing and irradiation. Unit operations in food processing and preservation: fluid flow, heat transfer, concentration by evaporation, drying, separation methods. Mixing, Size reduction, Sterilization process. Calculations in food engineering.

Packaging in food industry. Technology for processing and preservation fo specific industries: cereals, fruits and vegetables; fish, milk and dairy products; oil and fats.

Sugar technology: introduction, composition of cane and juice, manufacturing of raw cane sugar, extraction of juices, purification of juices, treatment of mud water and clarified juice, evaporation, heating, crystallization. Cane sugar refining: clarification, decolorization, crystallization and finishing. Microbiology in sugar manufacture and refining. Economics of sugar industry.

Polmeric Materials and Technology

Introduction to polymers and polymer processing principles: mechanical, electrical, thermal and optical properties of polymeric materials with special reference to time-temperature and environmental effects and testing standards. Formulation and compounding: principles and practice, degradation and stabilization of polymers. Rheological properties of polymeric melt, solutions and suspension, and their measurements. Flow in channels of simple cross-section. Basic heat transfer. Analysis of the principles of extrusion, injection molding, film blowing, calendaring, mixing etc. for sizing equipment, power requirements and understanding of process performance. Processes and operations, planning of processing facilities, layout and maintenance. Health and safety measures.

Fuel Technology

Energy situation and sources in Bangladesh. Classification, analysis of fuels, properties of fuels, purification and fuels processing, storage and handling of fuels (designing of system and facilities). Energy saving devices.

Design and sizing of burners, combustion chambers (furnaces) and stack for different fuels. Kinetics of combustion, Evaluation of burner and furnace operations. Sampling and analysis of flue gases. Design and operations of tunnel kiln, rotary kiln, metal smelting furnaces, direct fired heaters. Safety in burner and furnace operations. Environmental considerations in fuel uses

Chemistry

Modern concepts of atomic structure, advanced concepts of bonds and molecular structure, study of crystal structures, modern periodic table, chemistry of transition metals, properties and uses of noble gases, acids and bases, chemistry of solutions, properties of dilute solutions, chemical equilibrium, thermochemistry, electric properties of solution and electrochemical cells, ionization of water and pH, chemical kinetics, phase rule and phase diagrams, chemistry of cements, silicates and limes, selected topics on organic chemistry. Introduction to organic polymer, basic concepts of dyes, color and constitution.

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