

**COURSE STRUCTURE FOR M.TECH PROGRAMME
IN
DRILLING ENGINEERING**

I SEMESTER

Course No.	Subject	L – T – P	Credit Hours
AMC 51101	Advanced Numerical Methods and Applied Statistics	4 – 0 – 0	8
MMC 51104	Diamond Drilling	3 – 0 – 0	6
MMC 51105	Drilling Fluids and Polymers	3 – 0 – 0	6
MMC 51106	Drilling Fluid Handling Equipment	3 – 0 – 0	6
EEE 51122 GPE 51103 MME 51102	Elective (any one) (a) Electrical Equipment for Drilling (b) Introduction to Rock Physics & Exploration Geophysics (c) Maintenance Engineering Systems	3 – 0 – 0	6
PRACTICAL/PLANT VISIT/EXCURSION			
MMC 51204	Diamond Drilling	0 – 0 – 2/2	1
MMC 51205	Drilling Fluid Handling Equipment	0 – 0 – 2/2	1
MMC 51601	Industrial Visits	0 – 0 – 0	2
TOTAL		16 – 0 – 2	36

II SEMESTER

Course No.	Subject	L-T-P	Credit Hours
MMC 52104	Water Well and Blast Hole Drilling	3 – 1 – 0	7
MMC 52105	Oil Well Drilling	3 – 1 – 0	7
MMC 52101	Fluid Power Systems	3 – 1 – 0	7
MSC 52105	Advanced Decision Modeling	4 – 1 – 0	9
MME 52105 MME 52102 CME 52107	Elective (any one) (a) Engineering Materials and Tribology (b) Computer Aided Maintenance (c) Environmental Engineering	3 – 0 – 0	6
PRACTICAL/PLANT VISIT/EXCURSION			
MMC 52201	Fluid Power System	0 – 0 – 2	2
MMC 52001	Comprehensive Viva Voce	0 – 0 – 0	2
	Industrial Training (4 weeks, to be credited in IIIrd Sem.)	-	-
TOTAL		16 – 4 – 2	40

III SEMESTER

Course No.	Subject	L-T-P	Credit Hours
MMC 53901	Industrial Training (to be credited from II nd Semester)	0 – 0 – 0	4
MMC 53401	Seminar & Viva-Voce on Industrial Training	0 – 0 – 0	2
MMC 53501	Comprehensive Viva-Voce	0 – 0 – 0	4
MMC 53901	Interim Dissertation	0 – 0 – 0	15
MMC 53402	Seminar & Viva- Voce on Dissertation	0 – 0 – 0	10
MMC 53001	Teaching Assignment Evaluation/ Laboratory Development Work etc.	0 – 0 – 0	5
Total		0 – 0 – 0	40

IV SEMESTER

Course No.	Subject	L-T-P	Credit Hours
MMC 54901	Dissertation	0 – 0 – 0	20
MMC 54401	Seminar on Dissertation	0 – 0 – 0	5
MMC 54501	Viva-voce on Dissertation	0 – 0 – 0	10
MMC 54001	Teaching Assignment Evaluation/ Laboratory Development Work etc.	0 – 0 – 0	5
Total		0 – 0 – 0	40

Syllabus

AMC 51101 ADV. NUMERICAL METHODS AND APPLIED STATISTICS

4-0-0

Section –A (Advanced Numerical Methods)

Review of solution of system of linear simultaneous equation; Solution of tri-diagonal system; Ill conditioned system and iterative method to improve accuracy of an ill conditioned system; Evaluation of double and triple integrals by numerical method and its application; Solution of non-linear simultaneous equations; Numerical solution of integral equations; Advanced method of interpolation; Spline interpolation; Numerical solution of simultaneous first order ordinary differential equations and higher order O.D.E; Initial and boundary value problems; Numerical solution of partial differential equations; Laplace and Poisson equation; Heat conduction and wave equations; Writing computer programs of the above methods.

Section-B (Applied Statistics)

Review of binomial, negative binomial, Poisson, normal and log normal distributions; Tests for significance for mean, variance, correlation and regression coefficients; χ^2 - test for goodness of fit; Attributes and contingency table; F-test; Test of proportions; Tests of significance under large sample

approximations; Non- parametric tests; Wald-Wolfowitz run test; Test of randomness; Median Test; Sign test; Mann-Whitney Wilcoxon U-test; Time series analysis; Introduction to reliability and life testing experiments in engineering problems; One way and two way analysis of variance; Completely Randomized Design(CRD); Randomized Block Design(RBD); Latin Square Design(LSD).

MMC51104

DIAMOND DRILLING

3-0-0

Principles of diamond drilling; Rock cutting mechanism by diamond drilling; Types of drills; Drill components and operational features; Various diamond drilling accessories and their uses; Wire-line drilling equipment and practices; Diamond bits; Reamer shells and TC bits; Diamond drilling methods in minerals, coal seam degasification, foundation and structure testing and ground stabilization; Sludge collection; Deep drilling techniques; Problems and remedial methods; Fishing and fishing tools; Deviation of drill holes, measurements and correction; Soil sampling tools and techniques; Standard for diamond drilling accessories; Rig capacity and equipment planning; Cost of drilling operations; Planning of drilling operations; Field record keeping and monitoring; Geo-technical drilling; Measurements while drilling(MWD); On-line measurements; Directional drilling and measurements.

MMC 51105

DRILLING FLUIDS AND POLYMERS

3-0-0

Types, functions, testing and selection of drilling fluids; Removal of drilled solids; Rheology of drilling fluids; Filtration properties of drilling fluids; Hole stability; Drilling problems related to drilling fluids; Drilling fluid components; Composition, specifications, standards and testing of drilling fluids and polymers; Effect of additives on physical properties of drilling fluids and polymers; Contamination in drilling fluids; Rheology and control of drilling fluid properties; Special type of drilling fluids and polymers; Use of polymers in drilling fluids; Foams.

MMC 51106

DRILLING FLUID HANDLING EQUIPMENT

3-0-0

Application, types, constructional detail, selection and accessories of pumps for drilling operations; Flow characteristics; Power rating of pumps; Theory and operation of centrifugal pumps; Cavitation and causes; Rotary pumps; Air lift pumps; Jet pumps; Submersible pumps; Testing of pumps; Types, construction, operation and maintenance of air compressors; Capacity and power calculation of air compressors; Mud circulating equipment; Vibratory screen, de-gaser, de-sander, settling tanks and mud preparation equipment.

EEE 51122

ELECTRICAL EQUIPMENT FOR DRILLING

3-0-0

Diesel electric generation in fields; Mode of generation; Maintenance of electrical appliances; Electrical aspects of diesel electric rigs; Electrical drives for oil well drill rigs and equipment; Flame proof and intrinsically safe enclosures; Speed control techniques for ac and dc motors; Electrical power planning at drill sites; Switchgears, circuit breakers and their rating calculation; Illumination planning in oil well drill sites; Earthing, earth pits, protection of electrical equipment against lightning and other protective devices.

GPE 51103 INTRO. TO ROCK PHYSICS & EXPLORATION GEOPHYSICS 3-0-0

Physical and mechanical properties of rocks- density, magnetic susceptibility, resistivity, elastic stiffness, porosity, permeability etc and their variation with rock types; Rippability and drillability of rocks; Criteria of failures of rocks; Frame work of geophysical exploration- natural and artificial source method, principles of gravity, magnetic and self potential methods, data acquisition, processing and interpretation; Resistivity method- wenner and schlumberger configuration, profiling and sounding, interpretation of two layered curves; Seismic refraction and reflection methods- travel time curve over a horizontal interface, estimation of dip from reverse shooting; Principles of well logging- SP, resistivity, sonic and gamma logs, Archie's and Dercy's laws, elements of formation evaluation.

MME 51102 MAINTENANCE ENGINEERING SYSTEMS 3-0-0

Maintenance techniques- breakdown, preventive and condition based maintenance; RCM analysis of frequency and distribution of failure; Principles and application of fault analysis; Condition monitoring of machine components through vibration, oil and temperature monitoring; Trouble shooting of different equipment; Non-destructive testing techniques and their application in maintenance; Use of soft computing for maintenance.

II nd SEMESTER

MMC 52104 WATER WELL AND BLAST HOLE DRILING 3-1-0

Construction, operation and maintenance of rotary, hammer and percussion type water well drills; Accessories and their uses; Drilling and well construction in alluvium, hard rock and mixed formations; Water well design; Well casing and filters; Water well development and testing; Aquifer and well hydraulics; Problems in water well drilling and their remedies; Construction, operation and maintenance of blast hole drills, wagon drills, down the hole hammer drill, jumbo drills, and other rotary and percussive type drills used in mineral industry.

MMC 52105 OIL WELL DRILLING 3-1-0

Type of wells; Drilling methods- percussive, rotary and bottom drive drilling; Modern drilling techniques; Off-shore drilling rigs, components, bits, drill string accessories, hoisting, rotary systems and capacity calculation; Mud circulating system; Straight hole drilling; Directional drilling; Fishing operations; Casing program and design; Coring and core analysis; Drillometer; Drilling hazards; Bore hole problems; Drilling for coal bed methane; Use of blow out prevention; Casing programme and cementing.

MMC 52101 FLUID POWER SYSTEMS 3-1-0

Theory, construction, operation, characteristics and selection of different hydraulic components- pumps, motors, cylinders, valves, power pack etc. Construction, operation and characteristics of torque motor, electro-hydraulic valves, servo valves and their application; Use of programmable logic controller for sequence control in hydraulic drives; Maintenance of hydraulic control systems; Circuit layouts, presentation, labeling and control problem analysis; Theory, construction, operation and characteristics of pneumatic motors, cylinders, valves and other accessories; Pneumatic counters; Mixed control circuit design; Pneumatic control for hydraulic sequential power systems.

MSC 52105**ADVANCED DECISION MODELING****4-1-0**

Review of linear programming technique and its solution methodology; Integer programming and its application in managerial decision making, solution methodologies, zero-one programming; Dynamic programming- principle of optimality, concepts of state and stage, solution of discrete problems through backward dynamic programming, continuous and multistage dynamic programming problems, concept of stochastic dynamic programming problems; Introduction of Markov decision process; Markov decision problems; Queuing theory- definitions and classifications, birth and death process, single and multi server queues; Application of queuing analysis and decision making; Discrete event simulation- random number and random deviate generation, simulation of queuing, inventory and maintenance systems, validation of simulation models, sampling of simulation output and statistical inferences, variance reduction techniques; Concept of multi criteria decision making; Stochastic decision making models- decision tree, introduction to stochastic programming model.

MME 52105**ENGINEERING MATERIALS AND TRIBOLOGY****3-0-0**

Importance of material selection; Mechanical properties of ferrous, non-ferrous metals and their alloys; Non-metals and their uses; Specifications of steel; Materials for drills and its accessories; Classification, standardization and properties of lubricants; Testing of lubricants; Lubricants for extreme conditions; Environmental problems related to use of lubricants; Storage and handling of lubricants; Corrosion and wear related to drilling accessories; Materials used in drilling components/accessories.

MME 52102**COMPUTER AIDED MAINTENANCE****3-0-0**

Computers for maintenance planning and failure analysis; System design; Computer application for spare parts control and maintenance costing; Computer simulation for the planning of maintenance manpower and other facilities; Information system for effective maintenance; Computer application for data processing; Computer controlled condition monitoring of equipment; Application of artificial intelligence.

CME 52107**ENVIRONMENTAL ENGINEERING****3-0-0**

Environmental issues, policies, laws; Structure and functions of ecology and ecosystem; Water pollution- water quality parameters, their characteristics and standards, water quality monitoring, heavy metal pollution, eutrophication, deoxygenation, disinfections, water quality indices, water quality management and treatment; Air pollution- primary and secondary pollutants, air quality monitoring, standards and indices, meteorology and natural purification processes, engineered system for air pollution control, control devices for gaseous contaminants, vehicular pollution and control; Euro standards; Industrial noise abatement and control; Solid waste management- solid waste disposal design and operation of landfills; Environmental management systems; ISO 14000; Environmental auditing; Environmental impact assessment and preparation of EMP.
