MMIS-101 Advance Mathematics & Statistics

UNIT-I Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson's, Parabolic) using finite difference methods, Elementary properties of FT.

UNIT II Stochastic process, Markov process transition probability transition probability matrix, Markov chain. Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FC FS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS)

Unit-III Random variable – Two dimensional random variables – Standard probability distributions Binomial, Poisson and Normal distributions - Moment generating function, Sampling distributions – Confidence interval estimation of population parameters – Testing of hypotheses – Large sample tests for mean and proportion – t-test, F-test and Chi-square test

Unit-IV Curve fitting - Method of least squares - Regression and correlation – Rank correlation, multiple and partial correlation – Analysis of variance - One way and two way classifications; Time series analysis.

Unit-V Basics concepts of reliability - Failure rate analysis – Reliability of systems – Series, Parallel Maintenance - Preventive and corrective – Maintainability equation – Availability – Quality and Reliability.

References:

1. BOWKER and LIBERMAN, Engineering Statistics, Prentice-Hall.
2. GUPTA, S.C. and KAPOOR, V.K.; Fundamentals of Mathematical Statistics, SultanChand Pub
3. SPIEGEL, MURRAY R., Probability and Statistics, Schaum's series.
4. SPIEGEL, MURRAY R., Statistics, Schaum's series.
5. TRIVEDI K.S; Probability and Statistics with Reliability and Computer Science Applications; PHI;
6. KREYSZIG; Advanced Engineering Mathematics; Wiley

MMIS-102 Work Study And Productivity Management

Unit-1 Productivity Management: Concept of Productivity, Factors affecting Productivity, Total productivity model. Short term and Long term Productivity Planning Models. Productivity improvement Techniques: Technology based, Material based, Employee based, Product and Time based P.I. Techniques, Work Study: Definition, objectives and areas of application of work study in industries, Historical review,; Human aspects of work-study, Role of work-study in productivity improvement

Unit 2 Interrelation between method study and work measurement, Method Study: Definition and objectives; Engineering approach to methods analysis and improvement, Data collection and recording techniques; critical examination and development, creative thinking, tools of creativity, Installation and maintenance of the new improved methods. Motion Economy and Analysis: Principles of motion economy, motion analysis; Micro motion and memo motion study; Therbligs and Simo charts

Unit-3 Work Measurement: Definition and objectives; work measurement techniques, Stop watch time study, Principles and procedures, Systems of performance rating; calculation of basic time, allowances and standard time, predetermined motion time and other standard systems, introduction to MOST, Work Sampling : principles and techniques, application of work sampling studies.

Unit-4 Introduction to Ergonomics: Ergonomics as a multi-disciplinary field, components, Importance of ergonomics in equipment and work design, Concept of man-machine system; Types and characteristics of Man-machine systems, Rest Pause design based on physiological consideration, Anthropometry and Work place design.

Unit-5 Wage Incentives and Job Evaluation: Various types of wage Incentive schemes and their impact on productivity, Comparison of different incentive plans, design of incentive plans, Group system of Wage payment, Supervisory incentive plans. Job Evaluation: Purpose, Various types of jobs evaluation system and their application of classification. Wage Cure, Designing salary structure and Grade, Merit Rating, Performance Appraisal.

References:

1. Sumanth D.J., Productivity Management, TMH.
2. I.L.O., Introduction of Work Study, ILO
3. Maynard H.B., Industrial Engineering Hand Book.
4. McCormick, E.J. and Sanders, M.S., Human Factors in Engineering and Design, TataMcGraw
5. Jhamb L.C., Workstudy and Ergonomics.

MMIS-103 Occupational Health & Hygiene

Unit-I PHYSICAL HAZARDS: Noise, compensation aspects, noise exposure regulation, properties of sound, occupational image, risk factors, sound measuring instruments, octave band analyzer, noise networks, noise surveys, noise control program, industrial audiometric, hearing conservation programs vibration, types, effects, instruments, surveying procedure, permissible exposure limit. Ionizing radiation, types, effects, monitoring instruments, control programs, OSHA standard on- ionizing radiations, effects, types, radar hazards, microwaves and radio-waves, lasers, TLV- cold environments, hypothermia, wind chill index, control measures- hot environments, thermal comfort, heat stress indices, acclimatization, estimation and control

Unit-II CHEMICAL HAZARDS: Recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases, types, concentration, Exposure vs. dose, TLV - Methods of Evaluation, process or operation description, Field Survey, Sampling methodology, Industrial Hygiene calculations, Comparison with OSHAS Standard. Air Sampling instruments, Types, Measurement Procedures, Instruments Procedures, Gas and Vapour monitors, dust sample collection devices, personal sampling Methods of Control - Engineering Control, Design maintenance considerations, design specifications - General Control Methods - training and education

Unit-III BIOLOGICAL AND ERGONOMICAL HAZARDS: Classification of Bio hazardous agents –bacterial agents, rickettsial and chlamydial agents, viral agents, fungal, parasitic agents, infectious diseases - Biohazard control program, employee health program-laboratory safety program-animal care and handling-biological safety cabinets - building design. Work Related Musculoskeletal Disorders –carpal tunnel syndrome CTS- Tendon pain disorders of the neck- back injuries.

Unit-IV OCCUPATIONAL HEALTH AND TOXICOLOGY: Concept and spectrum of health - functional units and activities of occupational health, services, pre-employment and post-employment medical examinations - occupational related diseases, levels of prevention of diseases, notifiable occupational diseases such as silicosis, asbestosis, pneumoconiosis, siderosis, anthracosis, aluminosis and anthrax, lead-nickel, chromium and manganese toxicity, gas poisoning (such as CO, ammonia, coal and dust etc) their effects and prevention – cardio pulmonary resuscitation, audiometric tests, eye tests, vital function tests. Industrial toxicology, local, systemic and chronic effects, temporary and cumulative effects, carcinogens entry into human systems

Unit-V OCCUPATIONAL PHYSIOLOGY: Man as a system component, allocation of functions, efficiency, occupational work; capacity – aerobic and anaerobic work – evaluation of physiological requirements of jobs; parameters of measurements – categorization of job heaviness – work organization – stress –strain – fatigue – rest pauses – shift work – personal hygiene.

References:

1. Handbook of Occupational Health and Safety, NSC Chicago, 1982
2. Encyclopedia of Occupational Health & Safety, Vol. I & II, International Labor Organization; Geneva
3. McCornick, E.J. and Sanders, M.S., Human Factors in Engineering and Design, TataMcGraw-Hill

MMIS-104 Industrial Safety Management

Unit-I CONCEPTS:

Evolution of modern safety concept- Safety policy - Safety Organization - line and staff

functions for safety- Safety Committee- budgeting for safety.

Unit-II TECHNIQUES

Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

Unit-III ACCIDENT INVESTIGATION AND REPORTING

Concept of an accident, reportable and non reportable accidents, unsafe act and condition –principles of accident prevention, Supervisory role- Role of safety committee – Accident causation models - Cost of accident. Overall accident investigation process - Response to accidents, India reporting requirement, Planning document, Planning matrix, Investigators Kit, functions of investigator, four types of evidences, Records of accidents, accident reports-Class exercise with case study.

Unit-IV SAFETY PERFORMANCE MONITORING

permanent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety “t” score, safety activity rate – problems.

Unit-V SAFETY EDUCATION AND TRAINING

Importance of training-identification of training needs-training methods – programme,

seminars, conferences, competitions – method of promoting safe practice - motivation –

communication - role of government agencies and private consulting agencies in safety

training – creating awareness, awards, celebrations, safety posters, safety displays, safety

pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

References:

1. Accident Prevention Manual for Industrial Operations”, N.S.C.Chicago, 1982
2. Heinrich H.W. “Industrial Accident Prevention” McGraw-Hill Company, New York, 1980.
3. Krishnan N.V. “Safety Management in Industry” Jaico Publishing House, Bombay, 1997.
4. John Ridley, “Safety at Work”, Butterworth & Co., London, 1983.
5. Blake R.B., “Industrial Safety” Prentice Hall, Inc., New Jersey, 1973

MMIS 105 Environment and Pollution Control

Unit 1 Ecosystem: definition, concepts, structure, realm of ecology, lithosphere, hydrosphere, biosphere, atmosphere-troposphere-stratosphere; energy balance to earth, matter and nutrient recycling in ecosystems; nitrogen, oxygen, carbon and water cycles, food producers, consumers and decomposers, food chains; biodiversity, threat and conservation of biodiversity. Worldviews and environmentally sustainable economic growth, introduction to Design For Environment (DFE), product lifecycle assessment for environment and ISO 14000; triple bottom-line of economic, environment and social performance; environmental ethics, its world impact and challenges.

Unit 2 (a) Air **pollution**-primary, secondary; chemical and photochemical reactions, effects of CO, NO, CH and particulates, acid rain, Ozone depletion; monitoring and control of pollutants
(b) Noise pollution-sources and control measures.
(c) Water pollution, analysis and management, heavy metals- and nuclear pollutions; industrial pollution from paper, pharmacy, distillery, tannery, fertilizer, food processing and small scale industries.

Unit 3 Society and environment: exponential growth in population, environmentally optimum sustainable population, free access resources and the tragedy of commons; environment problems and impact of P.A.T (Population, Affluence and Technology), environmentally beneficial and harmful technologies; environment impact assessment policies and auditing, interaction between environment, life support systems and socio-culture system.

Unit 4 Health and risk: risk definition and assessment; types of hazards; tobacco and drug hazards; biological- viral and bacterial hazards; chemical hazards- toxic agents; effect on immune, nervous and endocrine systems; toxicity; dose response curves; lethal dose; health-risk analysis;; system reliability; ; risk perception and distortion; tips to estimate risks.

Unit 5 Ethics and Environment moral values, ethical situations, objectives of ethics and its study, role morality and conflicts; Non-professional, quasi- and hard-professionals; preventive, personal, common and professional ethics; different ethical value criteria like utilitarian, virtue, right and duty.
Human as habitant- not proprietor of environment, Contrasting views of utilitarian and ecological justification- solution by environment equity and priority principle; concept of human rights and environment; Geneva draft of 1994; value education and human duties; codes of ethics and their limitations; Institute of engineers code for corporate member, IEEE and ACM professional-code.

References:

1. Miller G. T Jr; Living in the environment-Indian edition; Cengage Learning.
2. Cunningham W; Principles of Environmental Science: TMH
3. Harris CE, Prichard MS, Rabins MJ, Engineering Ethics; Cengage Pub.
4. Rana SVS; Essentials of ecology and environment; PHI Pub.
5. Gerard Kiely; Environmental Engineering; TMH
6.

MMIS-106 Productivity And Industrial Safety Laboratory I

PRACTICAL /LAB WORK

STUDENT IS REQUIRED TO SUBMIT A JOURNAL/REPORT FOR THE SAME

List of Experiments to be expanded.

Unit-I . NOISE LEVEL MEASUREMENT AND ANALYSIS

Measurement of noise level for various sources – Impact, continuous and intermittent. Frequency and spectrum analysis of noise: Instrument – precision type of Noise level meter with frequency and spectrum analyzer.

VIBRATION MEASUREMENT AND ANALYSIS

Measurement of whole body vibration for various acceleration: Instrument – vibration simulator and vibration analyzer

Unit-II FRICTION SENSITIVITY TEST

Measurement of friction sensitivity for unstable materials: Instrument – BAM friction tester

IMPACT SENSITIVITY TEST

Measurement of impact sensitivity for unstable materials: Instrument – BAM fall hammer

THERMAL REACTIVITY TEST

Measurement of thermal reactivity for unstable materials: Instrument – DSC/TGA

Unit-III EXHAUST GAS MEASUREMENT AND ANALYSIS

Measurement of Exhaust gas measurement of IC engines: Instrument – Gas analyzer

BREATHING ZONE CONCENTRATION

Measurement of breathing zone concentration of dust and fumes: Instrument – personal air sampler

Unit-IV AMBIENT AIR MONITORING

Measurement of respirable and non-respirable dust in the ambient air: Instrument – High

volume sampler

CONSEQUENCE ANALYSIS

Soft computing skills on developing effects of fire & explosion and dispersion: Software –

PHAST 1 and ALOHA

Unit-V STUDY OF PERSONAL PROTECTIVE EQUIPMENT:

Safety helmet, belt, hand gloves, goggles, safety shoe, gum boots, ankle shoes, face shield, nose mask, ear plug, ear muff, apron and leg guard.

STUDY OF FIRE EXTINGUISHERS

Selection and demonstration of first-aid fire extinguishers: soda acid, foam, carbon dioxide

(CO2), dry chemical powder, halon.

MMIS-107 Lab II Occupational Health And Hygiene

PRACTICAL /LAB WORK / CASE STUDIES RELATED OCCUPATIONAL HEALTH AND HYGENE STUDENT IS REQUIRED TO SUBMIT A JOURNAL/REPORT FOR THE SAME

List of Experiments to be expanded.

1. To study the basic anatomy, Physiology & pathology of Human Systems.
2. To study, the Industrial toxicology with the help of common toxicants inside the industry.
3. To study the industrial hygiene related Government regulation & their Impact on Environment.
4. To study the Industrial Hygiene control methods.
5. Study the overview of Industrial Hygiene.