

FIRST SEMESTER**Math 111 3 (3+0)
Engineering Mathematics – I****(48 Lectures)**

- Unit 1 Algebra**
Permutation and combination, Binomial, logarithmic and exponential series, probability-introduction, addition, and multiplication rules and simple problems based on these.
- Unit 2 Coördinate Geometry**
Coordinates, distance between points, coordinates of division of a straight line joining two points, area of a triangle and a quadrilateral, equation of straight line, change of axes, pair of straight lines, circle, parabola, ellipse and hyperbola.
- Unit 3 Differential Calculus**
Functions, limits, continuity, derivative, rules of differentiation, derivatives of algebraic rational, trigonometric, inverse trigonometric, exponential and logarithmic functions, equation of tangents and normals, maxima and minima.
- Unit 4 Matrices and Eigen Values**
Matrices, definition, addition and multiplication of matrices, Complex and unitary matrices, some special matrices, determinants upto order 3, Elementary row and column transformation, Eigen values and eigen vectors
- Unit 5 Vector Calculus**
Point function, Vectors, scalar and vector products of two vectors, equation of straight lines and planes, product of three or more vectors, Gradient, divergence and curl of a vector and their physical interpretations, Line, Surface and Volume integrals, Greens, Stokes and Gauss divergence theorem.
- Unit 6 Multiple Integral**
Integration, methods of integration including integration by parts, integration of products and power of trigonometric functions, trigonometric substitution in integrals, integrals involving $(Ax^2 + Bx + C)$, partial fraction, definite integrals, properties of definite integrals, Double and triple integral, Change of order, Change of variables, Beta and Gamma functions, Application to area, volume, Dirichlet integral and applications.

Text Books

1. Analytical Geometry of Two and Three Dimensions by Vasavada Hema.
2. Integral Calculus by Shanti Narayan, S Chand and Distributors, Ltd.
3. Mathematics for Scientists and Engineers, by Harold Cohen, Prentice Hall Isnc., New Jersey.
4. Math Concepts for Food Engineering by Richard W. Hartel, T. A. Howell, D. B. Hyslop, CRC Press.

Reference Books

1. Advanced Engineering Mathematics, by E. Kreyszig, Wiley Eastern

FQA 111 3 (2+1)
General Chemistry

(32 lectures + 16 Practicals)

Unit 1 Inorganic

Chemical bonds and molecules : Characteristics of covalent bond, ionic bond, coordinate bond, vander waals forces, hydrogen bond, metallic bond, factors affecting the formation of ionic/covalent compounds, Born Haber cycle, shapes of molecules, valence bond theory (hybridization), VSEPR concept, structure of water. Radioactivity: Radioactivity, types of radiation, properties of radiation, determination and measurement of radioactivity, types of radioactive decay, group displacement law, rate of disintegration and half life period. Acids and Bases: Elementary idea of Bronsted-Lowry and Lewis concepts of acids and bases (proton-donor acceptor and electron donor acceptor systems), relative strength of Lewis acids and bases , pH of solutions, buffers, acid base indicators, pH range of indicators, choice of suitable indicator

Unit 2 Organic

Nomenclature of organic compounds : Concept of functional group, nomenclature, basic rules of IUPAC nomenclature, nomenclature of mono-, bi-functional and aromatic compounds, Stereochemistry : Isomerism – Definition and classification, structural isomerism (chain, position and functional), stereoisomerism, properties of stereoisomers, chirality, enantiomers, asymmetric carbon atom, configuration and conformation, Hydrogen bonding: Concept of hydrogen bonding, intermolecular and intramolecular hydrogen bonding, hydrogen bonding in alcohols, carboxylic acids and other molecules, Alcohols, aldehydes and ketones, carboxylic acids, amines, phenols, Important properties and their reactions.

Unit 3 Physical

States of matter: Gases: Kinetic theory of gases, derivation of the kinetics gas equation, characteristics of gases, Gas laws, Boyle's law, Charles law, Gay Lussac's law, Avogadro's law, Ideal gas equation, van der Waal's equation of state, liquefaction of gases, methods of liquefaction, Liquids: Introduction, surface tension, viscosity, their experimental determination, refractive index, molar refraction, optical activity, specific rotation , Nernst distribution law, Chemical-kinetics: Introduction, rate of reaction, law of mass action, order of reaction - first order, second order, units of rate constant. Introduction to analytical techniques : Chemical methods, chromatography, spectroscopic, fluorescence, photochemistry, their principle and analytical applications

Practical Title

- 1 Safety in chemistry laboratory
- 2 Oxidation reduction titration using KMnO_4 and potassium dichromate
- 3 Estimation of sodium thiosulphate, potassium dichromate and copper sulphate in the unknown samples
- 4 To determine pH of the solutions using pH meter
- 5 Volumetric titrations
- 6 Complexometric titration
- 7 Acid base titration using two burettes
- 8 Melting point determination
- 9 Boiling point determination
- 10 Detection of functional groups in organic compounds
- 11 To determine soluble solids using Abbe's refractometer
- 12 To determine the viscosity of given liquid using Brookfield viscometer
- 13 To determine viscosity of the liquids using Ostwald viscometer
- 14 Determination of specific gravity of liquids using specific gravity bottle method
- 15 Spectrophotometric determination of ascorbic acid
- 16 Separation of compound using paper chromatography/TLC

Text books

- 1 Concise Inorganic chemistry, 5th ed, Blackwell science Ltd *by* J D Lee
- 2 Organic chemistry, 6th ed., Pearson Education Ltd *by* R T Morrison & R N Boyd
- 3 Essentials of Physical Chemistry {24th Ed.} S. Chand and Company Ltd *by* B S Bahl, G D Tuli and Arun Bahl
- 4 Advanced inorganic chemistry *by* Malik, Tulli, Madan, Pathania
- 5 Analytical chemistry *by* B.K. Sharma

Reference books

- 1 Organic chemistry, 8th ed., John Wiley & sons *by* T W Graham Solomons and C B Fryhle
- 2 Physical chemistry R.Chand & Co *by* S C Khetarpal and Yogesh Sharma
- 3 Physical Chemistry, Prentice Hall *by* G K Vemulapalli

FQA 112 3 (2+1)
General Microbiology

(32 lectures + 16 Practical)

Unit 1	Introduction Scope and history of microbiology (notable contributions of Leeuwenhoek, Pasteur, Koch, etc.), classification and identification of micro organism, ocular and stage micrometers, size determination of microorganisms. Principles of microscopy; uses of microscopes, simple and compound microscope, phase contrast, dark field, ultra violet, fluorescent, electron microscope (SEM and TEM). Principles and types of stains and staining techniques.
Unit 2	Microbial Ultra Structure and Functions General structure of prokaryotic and eukaryotic cell, cell wall, plasma membrane, protoplasm, endoplasmic reticulum, lysosome, golgi apparatus, centriole, cilia, flagellum, storage bodies and ribosomes, chloroplasts, mitochondria and nucleus.
Unit 3	Microbial Morphology, Metabolism and Growth General morphological, cultural characteristics and reproduction of bacteria (bacterial metabolism – nutrition and respiration, bacterial reproduction, growth curve) fungi, algae, protozoa and viruses (bacterial viruses, animal viruses)
Unit 4	Cultivation and preservation of micro-organisms Importance, methods of isolation and cultivation, pure culture technique, enumeration methods for micro-organisms, preservation of microorganism
Unit 5	Control of microorganisms Physical and Chemical agents, antibiotics and other chemotherapeutic agents
Unit 6	Bacterial genetics Structure of DNA, difference between DNA and RNA, bacterial recombination (transformation, transduction, conjugation), bacterial mutations (spontaneous and induced), plasmids – properties, types, applications
Unit 7	Principles of immunology Innate and acquired immunity, difference between active and passive immunity, antigen and antibody reactions – neutralization, precipitation and agglutination
Unit 8	Applied and environmental microbiology Definitions and scope of industrial and environmental microbiology, microbiology of water and waste water, air, soil and industrial microbiology. Industrial uses of bacteria, yeasts and molds.

Practical	Title
1	Guidelines for safety and food microbiology laboratory work
2	Study of microscope and equipment commonly used in microbiology laboratory
3	Sterilization of glassware used in microbiology laboratory
4	Observation of permanent slides
5	Study of bacterial morphology by monochrome staining
6	Demonstration of morphology of cells by negative staining
7	Grams Staining technique.
8	Preparation of culture media and making Agar plates and Agar Slants
9	Measurement of microbes: Calibration of microscope using stage and ocular micrometer and measuring size of microbes
10	Identification of Gram (+) and Gram (-) bacteria
11	Isolation of microorganisms using Streak plate method
12	Isolation of microorganisms using Spread plate, pour plate method.
13	Control of microorganism by phenol coefficient method
14	Identification of spores by spore staining
15	Aseptic transfer technique and enumeration of microbes by serial dilution technique
16	Microbiological examination of water for coliforms by MPN technique

Text books

- 1 General Microbiology (Macmillan Press Ltd.) *by* Roger Y Stanier, John L Ingraham, Mark L Wheelis and Page R Painter
- 2 Microbiology (Tata McGraw Hill) *by* M J Pelczar, E C S Chan and N R Krieg
- 3 Elements of microbiology Vol. 1 & 2 *by* Modi

Reference Books

- 1 Industrial Microbiology McGraw Hill Book Co. New York *by* S C Prescott and C G Dunn
- 2 Fundamental Principles of Bacteriology Read books *by* A J Salle
- 3 Biology of microorganisms *by* T D Brock
- 4 Microbiology *by* Bernard D Davis, R Dulbecco, H N Eisen and H S Ginsberg
- 5 Fundamentals of microbiology *by* I Edward Alcano
- 6 Microbiology – An Introduction *by* G J Tortora, B R Funke and C L Case
- 7 General Microbiology Vol. II. *by* C B Powar and H F Dagainawala

FPE 111 4 (2+2)
Basic Mechanical Engineering

(32 Lectures + 32 Practical)

Unit 1	Introduction Introduction to basic materials- ferrous & non-ferrous materials and important engineering materials such as timber, abrasive materials, silica, ceramics, glasses, graphite, diamond, plastic polymers and composite materials, their properties and applications. Safety measures in workshop. Indian Factory Acts on safety.
Unit 2	Measuring and Gauging Basic measuring instruments and gauges.
Unit 3	Heat treatment processes Introduction to hardening, tempering, annealing, normalizing, etc.
Unit 4	Welding Shop Introduction, types of welding, types of electrodes, types of flames, types of welding joints, edge preparation, welding techniques and equipments; Gas welding and gas cutting, arc welding. Introduction to soldering and brazing and their uses. Estimation of welding and soldering cost.
Unit 5	Blacksmith Shop Introduction to different tools and their uses; Different forging operations, defects of forging; brief ideas about power hacksaw, etc.
Unit 6	Carpentry Shop Introduction to various carpentry tools and materials; type of woods and their characteristics, brief ideas about band saw, wooden lathe circular saw, wood planner, etc.
Unit 7	Machine Shop Introduction to various workshop machines (1) Lathe, (2) Milling machine, (3) Shaper and planner, (4) Drilling and boring machine, (5) Grinder and (6) CNC machines. Length of cut, feed, depth of cut, RPM, cutting speed, time, time allowances. Estimation of machining time for different Lathe operations. Estimation of machining time for casting, shaping, slotting & planning operations, work holding and tool holding devices
Unit 8	Sheet-Metal Shop Introduction, different operations, sheet metal joints. Allowances for sheet metal, operations & joints, estimate of cost.

Practical	Title
1	Identification of different materials of manufacture.
2	Demonstration of different measuring instruments and measurement technique.
3	Identification of various hand tools.
4	Demonstration of various power tools and machine tools.
5-8	Simple exercises in Filing, Fitting, Chipping, Hack sawing, Chiseling, Tapping, etc.
9	Introduction to welding machine, processes, tools, their use and precautions.
10-11	Simple exercises on arc welding.
12-13	Simple exercises in gas welding.
14-15	Demonstration of various casting processes and equipments, tools and their use.
16-17	Exercises on mould making using one piece pattern and two piece pattern
18	Demonstration of mould making using sweep pattern and match plate pattern
19-24	Simple exercises on turning: step turning, taper turning, drilling and threading.
25-27	Introduction to shaper and planner machine and preparations of various jobs on them.
28-30	Introduction to drilling machines and preparation of a related jobs.
31-32	Demonstration of other important operations and preparation of additional jobs.

Text Books

1. Principles of Manufacturing Materials and Processes, by J.S.Campbell, Tata McGraw-Hill.
2. Basic Engineering Thermodynamics, by Joel Rayner, ELBS
3. Workshop Technology, Vols I & II, by W A J Chapman, ELBS
4. Mechanical Estimates and Costs by T. K. Bagga & S. C. Sharma, Khanna publishers, Delhi-6.

Reference Books

1. Shop Theory, by J Anderson & E E Tatro, Tata McGraw-Hill
2. Basic Mechanical Engineering , by T. S. Rajan, Wiley Eastern Ltd.
3. Basic Mechanical Engineering by Dr. R. P. Arora, Prof. B. K. Raghunath, Prof. J. P. Patel

FPE 112 4 (3+1)
Basic Electrical Engineering

(48 Lectures + 16 Practical)

Unit 1 AC Fundamentals

Definitions of cycle, frequency, time period, amplitude, Peak value, RMS value, Average value, etc. Equations of alternating voltages and currents, AC through resistance, inductance and capacitance. AC circuits, series and parallel circuits, Simple R-L, R-C and R-L-C circuits, circuit breakers.

Unit 2 3 Phase Systems

Star and Delta connections. Relationship between line and phase voltages and currents in Star and Delta connections. Power in three phase system with a balanced load. Measurement of power in 3 phase circuits.

Unit 3 Transformer

Introduction, Principle of operation, emf equation, phasor diagrams. Ideal transformer. Transformer on no load, Transformer under load, Equivalent circuits, Transformer losses, efficiency, Regulation, Open and short circuit test.

Unit 4 Alternator

Elementary principles. Construction and types of alternators. emf in alternators.

Unit 5 Induction Motor

Construction, rotor winding squirrel cage and phase wound rotors. Analysis of current and torque, motor housing, starting of motors, different starters. Selection of motors and its controls.

Unit 6 D.C. Machine:

- (a) Types, Construction and Operation of DC generator and their characteristics.
- (b) D.C. Motors, their starting, speed controls and characteristics.

Unit 7 Electric Power Economics

Maximum demand charge, Load factor and Power factor correction.

Unit 8 Electrical Wiring

Connectors & switches, system of wiring, domestic wiring installation, sub circuits in domestic wiring, simple control circuit in domestic installation, industrial electrification

Unit 9 Safety & protection

Safety, electric shock, first aid for electric shock other hazards of electrical laboratories & safety rules, use of Multimeter, grounding, importance of grounding, equipment of grounding for safety. Circuit protection devices, fuses, MCB, ELCB & relays.

Unit 10 Electrical Measuring Equipments

Classification, Characteristics of different electrical measuring systems and equipments.

Practical Title

- 1-2 Study of voltage resonance in L.C.R. circuits at constant frequency:
 - (a) Star connection study of voltage and current relation
 - (b) Delta connection study of voltage and current relation.
- 3 Measurement of Power in 3 phase circuit by wattmeter and energy meter:
 - (a) for balanced loads,
 - (b) for unbalanced loads.
- 4 Voltage and current relation in 3 phase transformers of various kinds of primary and secondary connection systems.
- 5-6 Starting of induction motors by; (a) D.O.L., (b) Manual stardelta, (c) Automatic stardelta.
- 7 Starting of slipring induction motors by normal and automatic rotor starters.

- 8 Test on 3 phase induction motor- determination of efficiency, line current, speed slip and power factor at various outputs.
- 9 Determination of relation between the induced armature voltage and speed of separately excited D.C. generator.
- 10 Magnetization characteristics of D.C. generator.
- 11 Study the starter connection and starting reversing and adjusting speed of a D.C. motor.
- 12-13 Problems on Industrial Electrification.
- 14-15 Study of various circuit protection devices.
- 16 Study of various measuring instruments.

Text Books

- 1. Basic Electrical Engineering by V. N. Mittle (Tata McGraw-Hill Publications).
- 2. Electrical Technology by B. L. Theraja & A. K. Theraja, Vol. I, II and IV.
- 3. Electrical Technology by H. Cotton (CBS Publishers).

Reference Books

- 1. Electrical Estimating & costing by Surjitsingh (Dhanpat Rai & Co.)

Ag 111 3(2+1)
Crop Production Technology

(32 Lectures + 16 Practical)

- Unit 1** Classification of crops, Effect of different weather parameters on crop growth and development. Principles of tillage. Soil-water-plant relationship, crop rotation, cropping systems, relay cropping and mixed cropping
- Unit 2** Crop Production Technology for major cereal crops viz., paddy, wheat, maize, pearl millet, sorghum, etc.; Major varieties, sowing time, method of sowing, spacing, interculturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.
- Unit 3** Crop Production Technology for major oilseed crops viz., groundnut, sesame, rapeseed, mustard, castor, etc.; Major varieties, sowing time, method of sowing, spacing, interculturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.
- Unit 4** Crop Production Technology for major pulse crops viz., pigeon pea, cowpea, gram, greengram, blackgram, etc.; Major varieties, sowing time, method of sowing, spacing, interculturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.
- Unit 5** Crop Production Technology for major spices and cash crops viz., cumin, coriander, funnel, ginger, garlic, sugarcane, etc.; Major varieties, sowing time, method of sowing, spacing, interculturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.
- Unit 6** Horticulture: Scope of horticultural. Soil and climatic requirements for fruits and vegetables, nursery raising and management.
- Unit 7** Crop Production Technology for major fruit crops viz., mango, banana, sapota, aonla, pomegranate, guava, etc.; Major varieties, time of transplanting, spacing, interculturing, fertilizer and water requirement, time and method of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.
- Unit 8** Crop Production Technology for major vegetable crops viz., potato, onion, tomato, chilli and other green and leafy vegetables; Major varieties, sowing time, method of sowing, spacing, interculturing, fertilizer and water requirement, time of harvest, maturity index, yield potential, cost of cultivation, income from production, etc.

Practical Title

- 1 Examination of soil profile in the field.
- 2 Introduction to different equipments utilized in a weather observatory.
- 3-4 Identification of seed of different agricultural crops and their varieties.
- 5 Study of seed viability and germination test.
- 6 Identification of different weeds and methods of their control.
- 7 Use of different interculturing equipments.
- 8-9 Study of water requirement of different crops.
- 10-11 Fertilizer application methods and equipments.
- 12 Judging maturity time for harvesting of crop.
- 13 Identification and description of important fruit and vegetable crops.
- 14 Preparation of nursery.
- 15 Study of different garden tools.

- 16 Practices of pruning and training in some important fruit crops.

Text Books

1. Principles of Agronomy, by: T. Y. Reddy and G. H. Shankara Reddy
2. Principles and Practices of Agronomy, by: S. S. Singh
3. Principles of Horticulture, by: Prasad and Kumar

Reference Books

1. Fundamentals of Agronomy, by: Rajat D.
2. Principles of Horticulture, by: Denison.

Eng 111 2 (1+1)
Language & Communication Skills (16 Lectures + 16 Practical)

- Unit 1** Introduction: Importance of language and communication skills in the engineering profession.
- Unit 2** Spoken and conversational English : Main features; agreement, disagreement, likes, dislikes and enquiries; debate and discussion
- Unit 3** Basic sentence patterns in English: agreement between subject and verb; proper use of pronouns, adjectives and adverbs; proper use of phrases and clauses. Some basic rules of composition.
- Unit 4** Concept of register; development of vocabulary; reference skills - dictionary, thesaurus, indexing, contents, glossary; reading of selected texts and discussions; vocabulary building tasks.
- Unit 5** Note-taking and note-making; linkage; development of paragraphs; cohesion, coherence and style.

Tutorials Grammar Tenses

- 1 Voice-Change,
- 2 Direct/Indirect narration,
- 3 Prepositions and Determiners,
- 4 Word-formation with parts of Speech,
- 5 Types of sentences,
- 6 Elementary Knowledge of English Sound with Word-stress,
- 7 Intonation Pattern.
- 8 Composition -
- 9 Letter,
- 10 Application,
- 11 Summary and report writing.

Reference Books

1. Intermediate English Grammar, by Raymond Murphy, Cambridge Uni. Press.
2. High School English Composite & Grammar, by Wren & Martin, S. Chand & Co.
3. Good English, by G H Vallins, Rupa & Co.
4. The Prose Readers : Essays for college writers, by Kim Flachman & Michal Flachman, Prentice-Hall of India