SEMESTER III

CS1312NUMERICAL ANNALYSIS& COMPUTER PROGRAMMING (2-1-0)

NUMERICAL ANALYSIS

Approximation and round of error truncation errors and Taylor series;

Determination of roots of polynomials and transcendental equations by Newton Raphson,secant and Barstow's method;

Solution of linear simultaneous linear algebraic equation by Gauss elimination and Gauss-siedeliteration method; Curve fitting-linear and non-linear regression analysis;

Backward, forward and central difference solution and their uses a numerical differentiation and integration. Application of different relations in the solution of partial differentiation.

Numerical solution of ordinary differentiation equation by Euler, Modified Euler, Runge-Kutta and Predictor-Corrector method;

Computer Programming

Introduction to computer programming in C and C++ languages. Arithmetic expression, simple programs. The emphasis should be more on programming techniques rather than the languages itself. The C programming language is being chosen mainly because of the availability of the compilers, books and other reference materials.

Example of some simple C program.Dissection of the program line by line; Concepts of variables, program statements and function calls from the library (printf for example);

C datatypes, int, char, float etc.

C expression, arithmeticoperations, relational and logic operation.

C assignment statements, extension of assignment to the operations; C primitive input output using get char and put cher, exposure to the scanf and printf functions.

C statements, conditional execution using if, else;operationally switch and break statements may be mentioned.

Concepts of loops; Example of loops in C using for, while and do-while;Optionally continue may be mentioned.

One dimensional arrays and example of iterative programs using arrays, 2-d arrays; Using in matrix computations.

Concept of sub-programming, functions. Example of functions.Argument passing mainly for the simple variables;

Pointers, relationship between arrays and pointers; Argument passing using pointers;

Array of pointers; Passing arrays as arguments;

Strings and string library;

Structure and unions, defining C structures, passing structures as arguments; Arguments; Program examples;

File I/O, Use of fopen, fscan and fprientfroutines.

Suggested Text Books and References

- Shastry S.S., "Numerical Methods", Prantice Hall Inc., India 1998.
- Noble Ben, "Numerical Methods", New Tork International Publications, New York, 1964. Stanson Ralph, G., "Numerical Methods for Engineering", Englewood Cliffs, N.J., Prentic Hall Inc., 1961.
- Buckinggham, R.a., "Numerical Methods", SiorIsac Pitman Sons.LVD,London,1957.
- Bukhvalove. N.S., "Numerical Methods", Mir.Pub. Moscow, 1977.
- Grewal,B.S.," Numerical Methods",KhannaPub.,New Delhi,1998.
- SudhitKaicker,"The Complete ANSI C", BPB Publications, New Delhi, 1996.
- Kernighan, B.W. and Ritchie D.M., "The C programming language",Prantic hall of India,1998.
- Byron, S.Gottfired,"programming with C", Tata McGraw Hill, 2nd edition 1998.

ME 1312 MATERIAL SCIENCE (2-1-0)

History of materials: Source of engineering materials;categorization of engineering materials[2 or 3 materials, their properties and hence their application just to make an illustrative point]; Periodic table approach to;

Engineering materials: Atomic bonding vis-à-vis properties of materials:Crystal structure and noncrystalline structure; Miller indices.

X-ray Diffraction: Defects, their origin, Frenkel and Schottky defects; Order- disorder, transformations, association of defects.Non- stoichiometric solids; role of defects in defining electronics properties of materials- Si, GaAs, Dislocations 3 hours.

Diffusion in solids, atom mobilizes; temperature and impurity dependence of diffusion, various diffusion processes.

Binary phase diagrams (Pb-Sr,Al-Si,and Au-Si etc) microstructure and its effects on properties. Materials for use in electronics drives: Polymers, ceramics, semiconductors and metals- their structure and properties, superconductors; dielectric, ferroelectric, memory and magnetic materials. Case studies, Quantum mechanical approach to structure of materials: Energy bands in solids; electrical conductivity; extrinsic and intrinsic semiconductors; carrier concentration: work function

Carrier transport mechanism: Scattering and drift of electrons and holes; diffusion and drift of carrier: Hall Effect.

Technology of fabrication of semiconductor devices; Unit operations: Thin film deposition; oxidation; diffusion; implantation lithography ;etching; metallization bonding; encapsulation and packaging; Description of a discrete drive fabrication ;IC fabrication technology.

Sensors and actuators: classification and terminology; acoustic sensor, mechanical sensors, magnetic sensors, radiation sensors, thermal sensors, biosensors, chemical sensors and Examples of integrated sensors.

Opto-electric materials and drives: Modulation of light: birefringence; Kerr effect, magneto detector, Photo devices, Lasers, Optical switching devices.

Structural, chemical characterization of materials- introduction to X-ray Analysis, optical microcopy, ESCA, SEM-EDAX, STM, AFM; case studies of Si, GaAs, ferrites, lithium niobate.

Environmental assessments of semiconductor device production retrospect and prospect.

ME-1303 STRENGTH OF MATERIALS (3-1-0)

Stress: axial load-safety concept, general concepts; stress analysis of axially loaded bars; member strength of design criteria.

Strain: Axial strain and deformation; strains and deformation in axially loaded bars, stress-strain relationship, Poison's ratio, thermal strain and deformation, strain concentration.

Generalization Hooke's law, pressure vessels, constitutive relationship- generalization concepts, relationship between elastic constants; thin wall pressure vessels.

Torsion: Tensional stress and deformation in circular members, design of circular members in torsion, closed coil helical spring.

SFD & BMD: Axial force, shear and bending moment diagram, introduction-direct approach for axial force, shear and bending, bending of beams with symmetrical cross- section.

Stress in Beam: Shear stress in beams; introduction-shear flow- shear stress in beams.

Combine Stress: Transformation of stress and strain; analysis for combined loading; transformation of stress and strain-Mohr's rule for stress transformation.

Deflection of beams: Introduction-deflection by integration-deflection by moment-area method.

Stability of column: Introduction-Euler's buckling load formula, Rankin's formula-introduction to beam column.

MH1302 MATHEMATICS-III (3-1-0)

Fourier series: Fourier series, Half-range series, Harmonic analysis

Solution in Series: Differentiation and integration of infinite series. Series solution of differential equations, Bessel and Legendre equations, their series solution, elementary properties of Bessel functions and Legendre polynomials

Complex Variables: Functions of a complex variable, Exponential, trigonometric, hyperbolic and logarithmic functions, Differentiation, Analytic functions, Cauchy-Riemann equations, conjugate functions, Applications to two-dimensional potential problems, Conformal transformations, Schwartz-Christoffel transformation, Cauchy's Integral theorem, Taylor's and Laurent's expansions, Branch points, zeroes, poles and residues, Simple problems on contour integration

Boundary Value Problems: Equations for vibrations of strings, heat flow and electrical transmission lines, Laplace's equation in Cartesian, cylindrical polar and spherical polar coordinates, Solution by separation variables

Integral Transforms: Fourier integral theorem, Fourier transforms, Convolution theorems, Inversion theorem for Fourier and Laplace transforms Simple applications of these transforms to one-dimensional problems

CE 1301 FLUID MECHANICS (3-1-0)

Introduction:

Fluids and continuum; Physical properties of fluids, ideals and real fluids, Newtonian and non-Newtonian fluids, Measurement of surface tension;

II. Kinematics of Fluid Flow:

Steady and Unsteady, uniform & non-uniform, laminar and turbulent flows one ,two and three dimensional flows,streamlines,streak lines and path lines, continuity Equation, rotation and circulation elementary explanation of stream function and velocity potential, graphical and experimental methods of drawing a pressure.

III. Fluid Statics:

Pressure-density-height relationship, manometer, pressure on plane and curved surface, Centre of Pressure, buoyancy; Stability of immersed and floating bodies, fluid masses subjected uniform acceleration, measurement of pressure.

IV. Dynamics of Fluid Flow:

Ruler's equation of motion alo0ng a streamline and its integration; Bernoulli's equation and its application Piton tube, flow through orifices, mouthpieces, nozzles weirs sluice gates under free and submerged flow condition, Aeration of nape, capitation, free and forced vortex, momentum equation and its application to stationary and moving vans, pipe bends. Problem related to combined application of energy and momentum equations.

V. Dimensional Analysis and Hydraulic Similitude:

Dimensional Analysis Buckingham's theorem;important dimensionless numbers and their significance

Geometric, kinematic and dynamic similarity model studies;

EE1301 ELECTRICAL MEASURMENTS AND INSTRUMENTATION (3-1-0)

Electrical Measurements: Characteristics of Measuring Instruments, Accuracy and precision, significant figures; slandered of Management &errors, Type of errors- Gross errors, systematic errors and random errors; Probability of errors- normal distribution of errors; limiting errors; Review of indicating and integrating instruments: voltmeter, Ammeter, Wattmeter, Multi-Meter and Energy- Meter.

Measurement of Resistance: Measurement of low resistance- Kelvin Double Bridge; Measurement of medium resistance- Wheatstone bridge method; Measurement of high resistance- Megger, Insulation resistance measurement.

Magnetic measurement: Measurement of magnetic flux, magnetic measurements using Hall Effect Measurement of self- inductance, mutual inductance; Measurement of capacitance.

Measurement of voltage: Potentiometer- Principle of the potentiometer, study of unbalanced conditions, potentiometer use for the measurement of resistance, current and voltage, AC potentiometers, AC Bridge method- Ac bridges under unbalanced conditions; current measurement; Ac bridges for Inductance and capacitance measurement.

Instruments: Moving coil and moving Iron meters, Dynamometer and Induction instruments-wattmeter and energy meter, Electronic voltmeter, multi meter, Instrument Transformer: Current and voltage transformers: frequency, phase and power factor meters, Electronic multi meters, Digital voltmeters, analog and digital Oscilloscopes, Time, frequency and phase angle measurement using CRO, Spectrum & wave analyzer, Storage Oscilloscope; Signal and Function generators, Digital Counters.

Instrumentation: Transducers- classification & selection of transducers, Strain Guage,Inductive and capacitive transducers, Piezo-electric and Hall-Effects transducers, Thermisters, Thermocouples, Photo- diodes& photo- transistors, Encoding type Digital transducers.

PRACTICAL/DRAWING/DESIGN

ME 1307- P Material Science Lab(0-0-3)

List of experiments

- To study the lattice structure of various types of unit cell. Observe the Miller Indices for various Planes and directions in a unit cell.
- To study the microstructure of cast iron, mild steel, brass , solder under annealed, cold worked, forged/ rolled conditions.
- To verify the Hall Effect
- To determine the fracture characteristics of ductile and brittle materials
- To determine the chemical composition of a few common alloys
- To determine percentage of C and SW content in an alloy with Fe as main constituent.

OR

ME 1308 – P Strength of Material Lab: (0-0-3)

List of experiments

- Introduction to testing equipments
- Uniaxial tension test (Mild steel, Timber)
- Uniaxial Compression test (Timber-along and across, concrete, bricks, etc.)
- Torsion test (Mild steel/ aluminum)
- Bending stress distribution in beams using demac gauges and extensometer
- Analysis of truss model with spring members
- Compression test on brick masonry specimen
- Hardness test
- Creep test
- Impact test
- Strength of etched and un-etched glass
- Spring test
- To study the microstructure of various metals

CS 1313- P Numerical Analysis and Computer Programming lab (0-0-3)

List of experiments

Development of computer program for

- Numerical integration by Trapezoidal and Simpson's rule
- Gauss-siedel integration method
- Various matrix operation and their use as sub-routines
- Uses of pointers, data structures, loops, arrays.

CE1303-P FLUID MECHANICS LAB (0-0-3)

List of Experiments:

- To determine experimentally the metacentric height of ship model.
- To verify the momentum equation experimentally.
- To determine the coefficient of discharge of an orifices (or a mouth pieces) of a given shape.
    - Also to determine the coefficient of velocity ant the coefficient and the contraction of a orifice (or the mouth pieces)
- 4. to plot the flow net for a given model using the concept of electrical analogy.
- 5. to measure surface tension of a liquid.
- 6. To obtained the surface profile and the total head distribution of a forced vortex.
- 7. To calibrate and orifice meter and study the variation of the coefficient of discharge with the Reynolds number.

References:

1. Grade, R.J.and A.G. Mirajgaoker."Engineering Fluid Mechanics (including Hydraulic Machines)"Second edition.,Nem Chand & Bros,Roorkee,1983.
2. Grade, R.J "Fluid Mechanics through problem" Woley Eastern Limited, New Delhi, 1989.
3. Hunter Rouse, "Elementary Mechanics of Fluids" John Wiley & Sons, Inc., 1946.
4. L.H.Shames, "Mechanics of fluids", McGraw Hill, Int. Student Education.
5. Vijay Gupta and S.K. Gupta "Fluid Mechanics and its applications". Wiley Eastern Ltd.

EE1302-P ELECTRICAL MEASURMENTS AND INSTRUMENTATION LAB (0-0-3)

List of Experiments:

- Study of Kelvin's Double Bridge and its application for measurement of low resistance.
- Schering Bridge for measurement of capacitance.
- Anderson's Bridge for measurement of capacitance.
- Study and use of LVDT or Displacement Transformer.
- Study and use of Time Division Multiplexing(TDM)
- Study and use of Frequency Division Multiplexing(FDM).