YEAR 2 SECOND SEMESTER COURSE OUTLINE

CEG 221

EEG 220: Lab

EEG 222

EEG 224

GEG 222

GEG 228

MEG 222

MEG 224

SSG 222

SSG 226

SSG 227

GEG222 - INTRODUCTION TO ENGINEERING STATISTICS (3 UNITS)

- Introduction to statistics: fundamentals of probability theory; random variables and expectations, discrete and continuous distributions, probability and relative frequency, independent trials.

- The Laplace De-Moivre’s lmit theorem, Poisson’s law.

- Concepts used in statistics: expectation of a sum, variance, covariance, correlations.

- Theory of errors, estimation of variance and correlation, linear regression, random events, frequency analysis, data reductin techniques.

- Distribution and density functions.

- Expectation and other moments.

LABORATORY:

- Introduction to R;

- Exploratiry data analysis: methods of visualisation and summary statistics sampling from standard discrete and continuous distributions (Bernoulli, Geometric, Poisson, Gaussian, Gamma) Generic methods for sampling from univariate distributions;

- The use of R to illustrate probabilistic notions such as conditioning, convolutions and the law of large numbers;

- Examples of modelling real data (but without formal statistical inference) and the use of visualizations to asses fit.

GEG228 - ENGINEERING IN THE SOCIETY (1 UNIT)

- Philosophy of science.

- History of engineering technology.

- Safety in engineering and introduction to risk analysis.

- The role of engineers in nation building.

- Invited lectures from professionals.

SSG222 - INTRODUCTION TO SYSTEM METHODOLOGY (1 UNIT)

- Systems thinking and viewpoint, systems in nature: e.g. solar and biological (circulatory, nervous, etc.), systems modelling, e.g. transportation, education, telecoms, etc.

- The role of the systems engineer.

- A case study of an operational system, system dynamics and optimality

SSG226 - INTRODUCTION TO NUMERICAL METHODS (2 UNITS)

- Solution of algebraic and transcendental equations by iteration.

- Finite differences

- Difference equations.

- Interpolation.

- Splines.

- Numerical solution of systems of linear equations; iteration methods.

- Ill-conditioning.

- Matrix analysis: methods of matrix inversion.

- Numerical evaluation of eigen values.

- Numerical integration applied to the error function and elliptic integrals.

SSG227 - ENGINEERING COMPUTER GRAPHICS (2 UNITS)

- Introduction to sketching and visualization, modelling techniques, CAD and 3D modelling, part and assembly design. Packages include AUTOCAD, Maya, Solid Edge, etc.

CEG 221 - MECHANICS OF MATERIALS II (2 UNITS)

- Tension, compression, torsion and hardness.

- Fracture mechanics, fatigue, creep and viscoelasticity.

- Elementary plasticity, thin plates and shells, yield criteria and stress concentration.

- Buckling instability, stress-strain transformation.

- Bending moment and shearing forces in beams.

- Bending: stress, slope and deflection, energy methods.

- Statically determinate and indeterminate stress systems.

EEG220 - FUNDAMENTALS OF ELECTRICAL ENGINEERING II LAB (1 UNIT) The laboratory course for fundamentals of electrical engineering II is designed to illustrate topics covered in the course

- AC to DC conversion

- DC shunt motor

- Tests on static transformer

- DC generator characteristics and measurement of high voltage by means of sphere gaps

- Generation and measurement of high DC voltages

EEG222 - FUNDAMENTALS OF ELECTRICAL ENGINEERING II (2 UNITS)

- E.M.F generation, single phase; rms, mean, form factor, peak factor, phasor diagram.

- Series and parallel resonance circuit.

- Resonance, Q-factor, impedance and power P, S ans Q 3 phase: delta and star conversion line and phase voltages.

- Complex notation and its application to RLC circuits.

- Introduction to D.C machines, A.C machines and transformers. Pre-requisite: EEG211

EEG224 - INTRODUCTION TO SWITCHING AND LOGIC SYSTEMS (2 UNITS)

- Number systems conversion between bases, arithmetic with bases other than ten, 1 ans 2s complement, BCD, weighted and unweighted codes; Gray codes.

- Truth function and truth tables.

- Boolean algebra and De-Morgan theorem, truth function set or venn diagram and truth tables.

- Minimization of boolean function using boolean algebra and karnaught map(K.-Map).

- Switching relays, logic circuits.

- Realization of simple combinational circuits, binary single bit address, simple code conversion, bit comparators.

- Introduction to multi-vibrator circuits; Astable, Mono-stable and Bi-stable. Pre-requisite: EEG213

MEG222 - FUNDAMENTALS OF FLUID MECHANICS (2 UNITS)

- Kinematics of the flow field: definitions of pathline, streamline, control volumen, system etc.

- Uniformity and steadiness of flow, conservation of mass, fluid element in general state of motion.

- Bernoulli and Euler equations.

- Dynamics of the flow field: forces in fluids, substantial or total derivatives, equations of motion in cartesian and polar coordinates, integration of Euler’s equation, integral form of momentum equation.

- Flow measurements: pressure, velocity and volumne flow rate. Fundamentals of compressible flow; one dimensional flow, continuity and momentum equations, non-superposition of compressible flows

READING STYLE:

Sunday: SSG 227

Monday: GEG 222 (statistics) / SSG 226 (Numerical Methods)

Tuesday: EEG 222 (Electrical Engineering II) / EEG 224(Switching and Logic)

Wednesday: CEG 221 (Mechanics of Materials)

Thursday: MEG 222(fluid mechanics)

Friday: All coding.

Saturday: SSG 222 (Systems Methodology) / GEG 228 (Engineering in Society)