AKTU B.E./B.Tech ECE Sem 4 syllabus

Mathematics-IV

Subject Code KAS302/KAS402

Mathematics-IV

(PDE, Probability and Statistics)

Module I: Partial Differential Equations
Origin of Partial Differential Equations, Linear and Non Linear Partial Equations of first order,
Lagrange's Equations, Charpit's method, Cauchy's method of Characteristics, Solution of Linear
Partial Differential Equation of Higher order with constant coefficients, Equations reducible to
linear partial differential equations with constant coefficients.

Module II: Applications of Partial Differential Equations:
Classification of linear partial differential equation of second order, Method of separation of
variables, Solution of wave and heat conduction equation up to two dimension, Laplace equation
in two dimensions, Equations of Transmission lines.

Module III: Statistical Techniques I:
Introduction: Measures of central tendency, Moments, Moment generating function (MGF) ,
Skewness, Kurtosis, Curve Fitting , Method of least squares, Fitting of straight lines, Fitting of
second degree parabola, Exponential curves ,Correlation and Rank correlation, Regression
Analysis: Regression lines of y on x and x on y, regression coefficients, properties of regressions
coefficients and non linear regression.

Module IV: Statistical Techniques II:
Probability and Distribution: Introduction, Addition and multiplication law of probability,
Conditional probability, Baye's theorem, Random variables (Discrete and Continuous Random
variable) Probability mass function and Probability density function, Expectation and variance,
Discrete and Continuous Probability distribution: Binomial, Poission and Normal distributions.

Module V: Statistical Techniques III:
Sampling, Testing of Hypothesis and Statistical Quality Control: Introduction , Sampling
Theory (Small and Large) , Hypothesis, Null hypothesis, Alternative hypothesis, Testing a
Hypothesis, Level of significance, Confidence limits, Test of significance of difference of means,
T-test, F-test and Chi-square test, One way Analysis of Variance (ANOVA).Statistical Quality
Control (SQC) , Control Charts , Control Charts for variables (X and R Charts), Control Charts
for Variables (p, np and C charts).

Text Books
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley &
Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory,
Universal Book Stall, 2003(Reprint).
3. S. Ross: A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd
Ed., Wiley, 1968.

Reference Books
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2.T.Veerarajan : Engineering Mathematics (for semester III), Tata McGraw-Hill, New
Delhi.
3. R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa Publishing

House, New Delhi.
4. J.N. Kapur: Mathematical Statistics; S. Chand & Sons Company Limited, New Delhi.
5. D.N.Elhance,V. Elhance & B.M. Aggarwal: Fundamentals of Statistics; Kitab Mahal
Distributers, New Delhi

Technical Communication

Technical Communication
(KAS301/401)

Unit -1 Fundamentals of Technical Communication:
Technical Communication: Features; Distinction between General and Technical
Communication; Language as a tool of Communication; Dimensions of Communication:
Reading & comprehension; Technical writing: sentences; Paragraph; Technical style: Definition,
types & Methods; The flow of Communication: Downward; upward, Lateral or Horizontal;
Barriers to Communication.

Unit - II Forms of Technical Communication:
Technical Report: Definition & importance; Thesis/Project writing: structure & importance;
synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar &
Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; 7 Cs
of effective business writing: concreteness, completeness, clarity, conciseness, courtesy,
correctness, consideration, C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Unit - III Technical Presentation: Strategies & Techniques
Presentation: Forms; interpersonal Communication; Class room presentation; style; method;
Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance;
emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis &
retention of audience interest; Methods of Presentation:

Interpersonal; Impersonal; Audience
Participation: Quizzes & Interjections.

Unit - IV Technical Communication Skills:
Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation
skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis;
Critical thinking; Nuances: Exposition narration & Description; effective business
communication competence: Grammatical; Discourse competence: combination of expression &
conclusion; Socio-linguistic competence: Strategic competence: Solution of communication
problems with verbal and non verbal means.

Unit - V Dimensions of Oral Communication & Voice Dynamics:
Code and Content; Stimulus & Response; Encoding process; Decoding process; Pronunciation
Etiquette; Syllables; Vowel sounds; Consonant sounds; Tone: Rising tone; Falling Tone; Flow in
Speaking; Speaking with a purpose; Speech & personality; Professional Personality Attributes:
Empathy; Considerateness; Leadership; Competence.

Reference Books
1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta
Sharma, Oxford Univ. Press, 2007, New Delhi.
2. Personality Development and Soft Skills by Barun K. Mitra, OUP, 2012, New Delhi.
3. Spoken English- A Manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison,
Orient Blackswan, 2013, New Delhi.
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan,
Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Practical Communication: Process and Practice by L.U.B. Pandey; A.I.T.B.S.
Publications India Ltd.; Krishan Nagar, 2014, Delhi.

6. Modern Technical Writing by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; U.S.
7. A Text Book of Scientific and Technical Writing by S.D. Sharma;

Vikas Publication, Delhi.
8. Skills for Effective Business Communication by Michael Murphy, Harward University, U.S.
9. Business Communication for Managers by Payal Mehra, Pearson Publication, Delhi.

Communication Engineering

Unit I Review of signals and systems, frequency domain representation of
signals, principles of amplitude modulation systems- DSB, SSB and VSB
modulations.

Unit II Angle modulation, representation of FM and PM signals, spectral
characteristics of angle modulated signals.

Unit III Review of probability and random process, Gaussian and white noise
characteristics, noise in amplitude modulation systems, noise in frequency
modulation systems, pre-emphasis and de-emphasis, threshold effect in
angle modulation.

Unit IV Pulse modulation, sampling process, pulse amplitude and pulse code
modulation (PCM), differential pulse code modulation. Delta modulation,
noise considerations in PCM, time division multiplexing, digital multiplexers.

Unit V Digital modulation schemes- phase shift keying, frequency shift keying,
quadrature amplitude modulation, continuous phase modulation and minimum shift keying.

Text/Reference Books:

1. Haykin S., "Communications Systems," John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering," Pearson Education,
2002.

3. Taub H. and Schilling D.L., "Principles of Communication Systems," Tata McGraw Hill,
2001.
4. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering," John
Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication," Kluwer
Academic Publishers, 2004.
6. Proakis J.G., "Digital Communications',' 4th Edition, McGraw Hill, 2000.
7. Abhay Gandhi, "Analog and Digital Communication," Cengage publication, 2015.

Analog Circuits

Analog Circuits

Credits:4

Diode circuits, amplifier models: Voltage amplifier, current amplifier,
trans-conductance amplifier and trans-resistance amplifier. biasing schemes for BJT and FET amplifiers, bias stability, various configurations
(such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis,
low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.

High frequency transistor models, frequency response of single stage and
multistage amplifiers, cascode amplifier, various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues, feedback topologies: Voltage series, current series, voltage shunt, current
shunt, effect of feedback on gain, bandwidth etc., calculation with practical
circuits, concept of stability, gain margin and phase margin.

Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt,

Clapp etc.), non-sinusoidal oscillators.

Current mirror: Basic topology and its variants, V-I characteristics, output
resistance and minimum sustainable voltage (VON), maximum usable load, differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR, Op-Amp design: Design of differential amplifier for a given specification,
design of gain stages and output stages, compensation.

Op-Amp applications: Review of inverting and non-inverting amplifiers,
integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications, active filters: Low pass, high pass,
band pass and band stop, design guidelines.

Signal Systems

Unit I Signals and systems as seen in everyday life, and in various branches of
engineering and science, energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals, system
properties: linearity, additivity and homogeneity, shift-invariance, causality, stability, realizability.

Unit II Linear shift-invariant (LSI) systems, impulse response and step response,
convolution, input-output behaviour with aperiodic convergent inputs, characterization of causality and stability of linear shift invariant systems,
system representation through differential equations and difference equations, Periodic and semi-periodic inputs to an LSI system, the notion
of a frequency response and its relation to the impulse response

Unit III Fourier series representation, Fourier transform, convolution/multiplication
and their effect in the frequency domain, magnitude and phase response,
Fourier domain duality , Discrete-Time Fourier Transform (DTFT) and the

Discrete Fourier transform (DFT), Parseval's Theorem, the idea of signal
space and orthogonal bases, the Laplace transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution
to differential equations and system behaviour.

Unit IV The z-Transform for discrete time signals and systems-Eigen functions,
region of convergence, z-domain analysis.

Unit V The sampling theorem and its implications- spectra of sampled signals,
reconstruction: ideal interpolator, zero-order hold, first-order hold, and so
on, aliasing and its effects, relation between continuous and discrete time
systems.

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems," Pearson, 2015.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and
Discrete," 4th edition, Prentice Hall, 1998.
3. B.P. Lathi, "Signal Processing and Linear Systems," Oxford University Press, 1998.
4. Douglas K. Lindner, "Introduction to Signals and Systems," McGraw Hill International
Edition: 1999.
5. Simon Haykin, Barry van Veen, "Signals and Systems," John Wiley and Sons (Asia)
Private Limited, 1998.
6. V. Krishnaveni, A. Rajeswari, “"Signals and Systems," Wiley India Private Limited,
2012.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems," John Wiley and
Sons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and
MATLAB," TMH, 2003.

9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems," TMH New Delhi,
2001.
10. A. Anand Kumar, “Signals and Systems,” PHI 3rd edition, 2018.
11. D. Ganesh Rao, K.N. Hari Bhat, K. Anitha Sheela, “Signal, Systems, and Stochastic
Processes,” Cengage publication, 2018.

Sensor and Instrumentation

Unit- I:
Sensors & Transducer: Definition, Classification & selection of sensors, Measurement of displacement
using Potentiometer, LVDT & Optical Encoder, Measurement of force using strain gauge, Measurement
of pressure using LVDT based diaphragm & piezoelectric sensor.
Unit-II:
Measurement of temperature using Thermistor, Thermocouple & RTD, Concept of thermal imaging,
Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of
proximity sensor as accelerometer and vibration sensor, Flow Sensors: Ultrasonic & Laser, Level
Sensors: Ultrasonic & Capacitive.
Unit -III:
Virtual Instrumentation: Graphical programming techniques, Data types, Advantage of Virtual
Instrumentation techniques, Concept of WHILE & FOR loops, Arrays, Clusters & graphs,
Structures: Case, Sequence & Formula nodes, Need of software based instruments for industrial
automation.
Unit-IV:
Data Acquisition Methods: Basic block diagram, Analog and Digital IO, Counters, Timers, Types of
ADC: successive approximation and sigma-delta, Types of DAC: Weighted Resistor and R-2R
Ladder type, Use of Data Sockets for Networked Communication.
Unit V:
Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors:
Self calibration, Self-testing & self-communicating, Application of smart sensors: Automatic robot

control & automobile engine control.

Universal Human Values

KVE401 Universal Human Values and Professional Ethics

UNIT-1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-2 Understanding Harmony in the Human Being - Harmony in Myself

Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

UNIT-3 Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society-Undivided Society

(AkhandSamaj), Universal Order (SarvabhaumVyawastha)-from family to world family!.

UNIT-4 Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT-5 Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

References:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan,

Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics
(including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal
Book Co., Lucknow. Reprinted 2008.