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# AKTU B.E./B.Tech CSE 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, 9th Edition, 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.

## **Theory of Automata and Formal Languages**

### **Theory of Automata and Formal Languages**

**Basic Concepts and Automata Theory:** Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with  $\epsilon$ -Transition, Equivalence of NFA's with and without  $\epsilon$ -Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata, Myhill-Nerode Theorem, Simulation of DFA and NFA

**Regular Expressions and Languages:** Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages, Regular Languages and Computers, Simulation of Transition Graph and Regular language.

**Regular and Non-Regular Grammars:** Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG,

Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky

Hierarchy, Programming problems based on the properties of CFGs.

## **Push Down Automata and Properties of Context Free**

**Languages:** Nondeterministic Pushdown

Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown

Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for

Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown

Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL,

Programming problems based on the properties of CFLs.

**Turing Machines and Recursive Function Theory** : Basic Turing Machine Model,

Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for

Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of

Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis,

Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondance

Problem, Introduction to Recursive Function Theory.

## **Operating Systems**

### **Operating systems**

**Introduction** : Operating system and functions, Classification of Operating systems- Batch,

Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems,

Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure,

System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel

Systems.

**Concurrent Processes:** Process Concept, Principle of Concurrency, Producer / Consumer Problem,

Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

**CPU Scheduling:** Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling.  
**Deadlock:** System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

**Memory Management:** Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

**I/O Management and Disk Scheduling:** I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

## **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

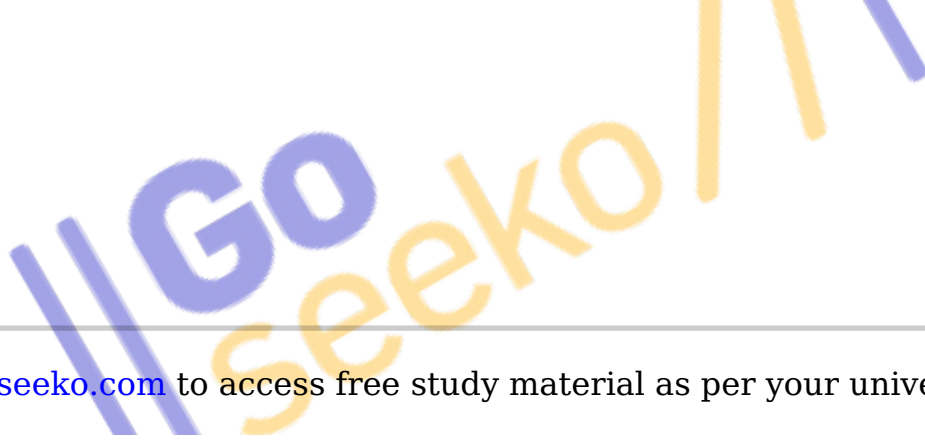
characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: 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 Govindrajan, 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.



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