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# AKTU B.E./B.Tech CSE Sem 1 syllabus

## Physics

### PHYSICS

#### Module - 1 Relativistic Mechanics:

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson- Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

#### Module- 2 Electromagnetic Field Theory:

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

#### Module- 3 Quantum Mechanics:

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

#### Module- 4 Wave Optics:

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhofer diffraction at single slit and at double slit,

absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

### **Module- 5 Fibre Optics & Laser:**

Fibre Optics: Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

### **Reference Books:**

1. Concepts of Modern Physics - Arthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal & Subramanian (S. Chand )
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

## **Chemistry**

### **CHEMISTRY**

#### **Module-1**

##### **Atomic and Molecular Structure:**

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

#### **Module-2**

##### **Spectroscopic techniques and Applications:**

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet & Visible and Raman spectroscopy.

#### **Module-3**

##### **Electrochemistry**

Nernst Equation and application, relation of EMF with thermodynamic functions ( $\Delta H$ ,  $\Delta F$  and  $\Delta S$ ). Lead storage battery.

**Corrosion;** causes, effects and its prevention.

**Phase Rule** and its application to water system.

## **Module-4**

**Water Analysis;** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

**Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulong's method).

## **Module-5**

**Polymer;** Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

### **Reference Books:**

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry By Fre W., Billmeyer
7. Engineering Chemistry By Satya Prakash

## **Mathematics-I**

### **MATHEMATICS-I**

#### **Module 1: Matrices**

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix,

#### **Module 2: Differential Calculus- I**

Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (nth order derivatives), Leibnitz theorem and its application, Envelope, Involutives and Evolutives, Curve tracing: Cartesian and Polar co-ordinates

#### **Module 3: Differential Calculus-II**

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

#### **Module 4: Multivariable Calculus-I**

**Multiple integration:** Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities),

#### **Module 5: Vector Calculus**

Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.

Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem ( without proof) and their applications.

#### **Text Books:-**

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

#### **Reference Books-**

- 1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
- 2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
- 3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
- 4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
- 5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
- 6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.
- 7.P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

9. Engineering Mathematics - I. Reena Garg, 2018.

## **Basic Electrical Engineering**

### **BASIC ELECTRICAL ENGINEERING**

#### **Module - 1: DC Circuits**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

#### **Module - 2: Steady- State Analysis of Single Phase AC Circuits**

Representation of Sinusoidal waveforms - Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor. Three phase balanced circuits, voltage and current relations in star and delta connections.

#### **Module - 3 : Transformers**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

#### **Module -4 : Electrical machines**

**DC machines:** Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

**Three Phase Induction Motor:** Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

**Single Phase Induction motor:** Principle of operation and introduction to methods of starting, applications.

**Three Phase Synchronous Machines:** Principle of operation of alternator and synchronous motor and their applications.



## **Module -5 : Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries. Elementary calculations for energy consumption and savings, battery backup.

### **Text Books:**

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.
2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

### **Reference Books:**

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.
3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

## **Programming for Problem Solving**

### **Programming for Problem Solving**

#### **Module - 1 : (Introduction to Programming)**

**Introduction to components of a computer system:** Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

**Idea of Algorithm:** Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

**Programming Basics:** Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

#### **Module - 2 : (Arithmetic expressions & Conditional Branching)**

**Arithmetic expressions and precedence:** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

**Conditional Branching:** Applying if and switch statements, nesting if and else, use of break and default with switch.

### **Module - 3 : (Loops & Functions)**

**Iteration and loops:** use of while, do while and for loops, multiple loop variables, use of break and continue statements.

**Functions:** Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

### **Module - 4 : (Arrays & Basic Algorithms)**

**Arrays:** Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

**Basic Algorithms:** Searching & Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

### **Module - 5 :( Pointer & File Handling)**

**Pointers:** Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

**File handling:** File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

### **Text books:**

1. Schum"s Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot

B. Koffman, Pearson Addison-Wesley, 2006.

9. Programming in C by Kochan Stephen G. Pearson Education - 2015.

10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.

11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.

12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication

13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication

14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

## **SOFT SKILLS-I**

### **KNC-101 SOFT SKILLS-I**

#### **UNIT I- Basics of Applied Grammar and usage**

Tenses: Part of Speech, Active & Passive Voice, Articles, Subject-verb agreement, Antonyms, Synonyms, Prefix and Suffix, Narration, Conditional sentences, Concord, Tag questions, punctuation marks.

#### **UNIT II- Presentation and Interaction Skills**

Speech Delivery, Interjecting: Objectives& Methodology; Group Discussion: Objectives & Methods; Theme

Presentation: Methods; Argumentative skills: Pattern and Ingredients; Debate & Discussion: Unity, Coherence & Emphasis.

Public Speaking: Audience Analysis: Approach and Style. Interviews: Types; Focus & Objectives.

#### **UNIT III- Interpersonal Communication Skills**

Features: Methods; Principles; Requisites; Team- work; Skills: Empathy, Emotional Intelligence, empathy and listening skills. Time Management; Attitude; Responsibility. Leadership qualities: Integrity; Values; Trust; Self- Confidence & Courage; Communication and Networking; Speed reading; Problem Solving & Trouble- Shooting.

#### **UNIT IV- Persuasion and Negotiation Skills**

Definition; Understanding Attitude, Beliefs, Values and Behavior; The process of Persuasion: Analysis of Audience; Classification of Audience; Egoistic and Non-Egoistic; Specific Techniques for Specific Audience; Skills of Persuasion, Steps to Persuasion/Influence, Negotiation: Definition; Process of Negotiation: Characteristics;



Qualities of good negotiator; Approaches to Negotiation.

## **UNIT V- Communication Skills**

Introduction to oral communication, Nuances & Modes of Speech Delivery, Public speaking: confidence, clarity, and fluency, Non verbal Communication: Kinesics, Paralinguistic features of Voice-Dynamics, Proxemics, Chronemics, and Presentation Strategies: planning, preparation, organization, delivery.

### **Prescribed Books:**

1. Technical Communication, (Second Ed.); O.U.P., Meenakshi Raman & S.Sharma New Delhi, 2011
2. Business Communication for Managers, Payal Mehra, Pearson, Delhi, 2012.
3. Personality Development, Harold R. Wallace et. al, Cengage Learning India Pvt. Ltd; New Delhi 2006
4. Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
5. Personality Development & Soft Skills, Barun K.Mitra, Oxford University Press, New Delhi, 2012.
6. Public Speaking, William S. Pfeiffer, Pearson, Delhi, 2012.
7. Human Values, A.N. Tripathi, New Age International Pvt. Ltd. Publishers New Delhi ,2005

## **Artificial Intelligence For Engineers**

### **KMC 101/201 ARTIFICIAL INTELLIGENCE FOR ENGINEERS**

#### **Unit 1 An overview to AI**

- 1.1 The evolution of AI to the present
- 1.2 Various approaches to AI
- 1.3 What should all engineers know about AI?
- 1.4 Other emerging technologies
- 1.5 AI and ethical concerns

#### **Unit 2 Data & Algorithms**

- 2.1 History Of Data
- 2.2 Data Storage And Importance of Data and its Acquisition
- 2.3 The Stages of data processing
- 2.4 Data Visualization
- 2.5 Regression, Prediction & Classification
- 2.6 Clustering & Recommender Systems

#### **Unit 3 Natural Language Processing**

- 3.1 Speech recognition
- 3.2 Natural language understanding
- 3.3 Natural language generation
- 3.4 Chatbots
- 3.5 Machine Translation

#### **Unit 4 Artificial Neural Networks**

- 4.1 Deep Learning
- 4.2 Recurrent Neural Networks
- 4.3 Convolutional Neural Networks
- 4.4 The Universal Approximation Theorem
- 4.5 Generative Adversarial Networks

#### **Unit 5 Applications**

- 5.1 Image and face recognition
- 5.2 Object recognition
- 5.3 Speech Recognition besides Computer Vision
- 5.4 Robots
- 5.5 Applications

#### **Reference Books:**

1. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig, Prentice Hall
2. Artificial Intelligence by Kevin Knight, Elaine Rich, Shivashankar B. Nair, Publisher : McGraw Hill
3. Data Mining: Concepts and Techniques by Jiawei Han, Micheline Kamber, Jian Pei, Publisher: Elsevier Science.
4. Speech & Language Processing by Dan Jurafsky, Publisher : Pearson Education
5. Neural Networks and Deep Learning A Textbook by Charu C. Aggarwal, Publisher: Springer International Publishing
6. Introduction to Artificial Intelligence By Rajendra Akerkar, Publisher : PHI Learning