

## **B.Tech Mechanical Engineering (AKU Syllabus) SEMESTER- IV**

### **BASIC ELECTRONICS**

- 1. PN junction diode** : Depletion layer, barrier potential, forward and reverse bias, break down voltage, PIV characteristics of PN junction diode, knee voltage, ideal PN junction diode, junction capacitance, break down diode(zener diode). Photo diode and light emitting diode. **Lecture : 10**
- 2. Rectifiers and filters** : Half wave and full wave rectifiers(centre tape and bridge), regulation ripple factor, R C ,L-C and Pi filters. Clipping and clamping circuit, voltage multiplier. **Lectu : 8**
- 3. BJT introduction** : Basic theory and operation of PNP and NPN transistors, characteristics of C-B,C-E,C-C configuration. **Biassing** : Base bias, emitter feedback bias, voltage divider bias, load line, operating point. Incremental analysis using h model. **Lecture : 12**
- 4. FET** : introduction, operation, JFET parameters, JFET characteristics, JFET amplifiers.  
**MOS FET** : Introduction, operation , MOSFET parameters . **Lecture : 4**
- 5. Feedback amplifiers.** **Lecture : 2**
- 6. Integrated circuit** : Characteristics of ideal, operational amplifiers. Application as inverting, non inverting amplifiers. Summer, difference, differentiator, integrator. **Lecture : 4**
- 7. Principle and application of SCR and UJT.** **Lecture : 2**

### **NUMERICAL METHOD & COMPUTATIONAL TECHNIQUE** Credit : 4

- 1. Introduction to computer language** : Machine language, assembly language, higher level language, compilers, problem solving using computer algorithm, flow chart, examples. **Lecture : 5**
- 2. C/C++ Programming** : Constant & variables, arithmetic expression, I/O statement, specification statement, control statements, subscripted variables, logical expression, function and subroutines, examples of programming should include numerical as well as non numeric applications, matrix operations, searching , sorting etc. **Lecture : 15**
- 3. Iterative Techniques for solution of equations** : i. **Solution of non linear equation** - Simple iteration scheme, Bisection method, Regula-falsi method, Newton - Raphson method, Secant method, their rates of convergence, order of errors etc. **Lecture : 5**  
ii. **Solution of linear equation** – Gaussian elimination, matrix inversion by Gaussian method, computation of determinants, Jacobi and Gauss Seidel iteration method. **Lecture : 4**
- 4. Polynomial approximation** : Interpolation, several form of interpolating polynomials like Lagrangian interpolation of polynomial and Newtons forward and backward difference formula, curve fitting(least square) .  
**Lecture : 6**
- 5. Numerical integration** : Trapezoidal method, Simpson's rule, order of errors in integration. **Lecture : 4**

**6. Solution of initial value problem :** Euler's method, Runge-Kutta second order and fourth order methods,  
solution of boundary value problem - Finite difference method.

### **OBJECT ORIENTED PROGRAMMING Credit : 5**

- 1. Introduction to C++ :** Object Oriented Technology, Advantages of OOP, Input-output in C++, Tokens, Keywords, Identifiers, Data Types C++, Derives data types. The void data type, Type Modifiers, Typecasting, Constant, Operator, Precedence of Operators, Strings. **Lecture : 3**
- 2. Control Structures :** Decision making statements like if-else, Nested if-else, goto, break, continue, switch case, Loop statement like for loop, nested for loop, while loop, do-while loop. **Lecture : 3**
- 3. Functions :** Parts of Function, User- defined Functions, Value- Returning Functions, void Functions, Value Parameters, Function overloading, Virtual Functions. **Lecture : 3**
- 4. Classes and Data Abstraction :** Structure in C++, Class, Build- in Operations on Classes, Assignment Operator and Classes, Class Scope, Reference parameters and Class Objects (Variables), Member functions, Accessor and Mutator Functions, Constructors, default Constructor, Destructors. **Lecture : 15**
- 5. Overloading & Templates :** Operator Overloading, Function Overloading, Function Templates, Class Templates. **Lecture : 5**
- 6. Inheritance :** Single and Multiple Inheritance, virtual Base class, Abstract Class, Pointer and Inheritance, Overloading Member Function. **Lecture : 5**
- 7. Pointers and Arrays :** Void Pointers, Pointer to Class, Pointer to Object, The this Pointer, Void Pointer, Arrays. **Lecture : 6**
- 8. Exception Handling :** The keywords try, throw and catch. Creating own Exception Classes, Exception Handling Techniques (Terminate the Program, Fix the Error and Continue, Log the Error and Continue), Stack Unwinding. **Lec: 5**

### **KINEMATICS OF MACHINERY Credit : 3**

- 1. Velocity and acceleration in mechanism :**
  - Relative velocity method and instantaneous center method
  - Acceleration diagram : Coriolis component of acceleration. **Lecture : 8**
- 2. Friction devices :**
  - Belt drive
  - Clutch
  - Shoe brakes
  - Band and block brakes. **Lecture : 7**
- 3. Fundamental law of gearing,** basic terminology of gears, arc of contact and path of contact of involute gears, minimum number of teeth on the pinion to avoid interference, Gear trains-simple, compound and planetary, tooth load and torque. **Lecture : 10**
- 4. Balancing :** balancing of revolving masses in the same plane by a single revolving mass – Balancing of revolving masses in different planes by two revolving masses in suitable planes. **Lecture : 7**

**5. Governors : Watt, Porter, Proel & hartnell Governors, Effect of friction, controlling force, governor effort and power, sensitivity and isochronisms. Lecture : 10**

**MANUFACTURING BY SHAPING AND JOINING Credit : 5**

**1. Casting :** Principles of pattern making, allowances in patterns and core boxes, sand mould casting, constituents and properties of moulding sand and their tests, types of sand moulds, method and principles of gating, risering, use of cores and chills, cleaning of casting, defects in castings and their remedies, sand mould machines, melting and casting practices relating to cast iron, steel, aluminium and its alloys, copper and its alloys. Cupola, crucible and electric furnaces, metal mould casting, gravity casting, die casting, centrifugal casting, non-metallic mould casting-shell mould casting, Investment casting, plaster of paris mould casting. **Lecture : 12**

**2. Mechanical working of metals :** Hot and cold working of metals, their comparison and limitation, Hot working process – forging, roll forging, rolling piercing, extrusion, cold working processes – rolling, spinning, roll forming, cold heating, swaging, thread rolling, tube and wire drawing, coining, embossing, tube rolling. **Lecture : 8**

**3. Power metallurgy :** Principles, method of producing power, pressing, sintering and finishing operation, applications. **Lecture : 4**

**4. Welding, Brazing and Soldering :** Comparison of the processes and their application, welding classification, Gas welding equipment, filler metal and fluxes, classification, oxy-acetylene welding – their applications. Electric arc welding – equipment, electrodes and fluxes, classification, carbon arc welding, shielded metal arc welding, submerged arc welding. Inert gas shielded arc welding. atomic – hydrogen welding – their application, new welding and laser beam welding, plastic welding, thermit welding, welding of cast iron, Aluminium and its alloys, copper and its alloys, Testing of weld destructive and non-destructive tests. Flange cutting, soldering – fluxes solder, equipments, type and applications. Brazing and braze welding fluxes, filler metals, types and application. **Lecture : 12**

**5. manufacturing of plastic components :** Plastic and its past, present and future uses, injection moulding, Extrusion of plastic section, welding of plastics, Future of plastic & its application. **Lecture : 6**

**MACHINE DRAWING Credit : 3**

**1. Introduction to full section, Half section, revolved-section off-set section. L : 2**

**2. Nut Bolts, Riveted joints, Thread profiles, Screw jack. Lecture : 3**

**3. Bushed bearing, pedestal, bearing, foot step bearing. Lecture : 2**

**4. Flanged coupling, flexible coupling, solid coupling. Lecture : 2**

**5. Stuffing Box. Lecture : 1**

**6. Eccentric. Lecture : 1**

**7. Cross Head. Lecture : 1**

**8. Assembly of disassembled parts. Lecture : 1**

**9. Disassembly of assembly parts. Lecture : 1**