

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
ANANTAPUR**

COURSE STRUCTURE FOR I YEAR B.Tech.(CCC)

MECHANICAL ENGINEERING

| S.No. | Code No. | Name of the Subject | Credits |
|--------------|-----------------|--|----------------|
| 1 | C1BS01 | Mathematics-I | |
| 2 | C1BS02 | Mathematics-I | |
| 3 | C1CS12 | Programming & Data Structures | |
| 4 | C1ME01 | Metallurgy & Material Science | |
| 5 | C1CE10 | Advanced Strength of Materials | |
| 6 | C1EC16 | Industrial Electronics | |
| 7 | C1CS13 | Computer Laboratory | |
| 8 | C1ME02 | Metallurgy & Material Science Laboratory | |

(C1 BS01)

MATHEMATICS-I

(Common to Civil, EEEI, Mechanical and ECE)

UNIT-I :

Sequences - Series - Convergence and divergence - Ratio test - Comparison test - Integral test - Cauchy's root test - Raabe's test – Absolute and conditional convergence. Rolle's theorem - Lagrange's Mean Value theorem - Cauchy's Mean value Theorem - Generalized Mean Value theorem (Taylor's Theorem)

UNIT-II :

Functions of several variables - limit and continuity - partial differentiation -Chain rule - Total derivative - Euler's theorem, Jacobian - Functional dependence. Maxima and Minima of functions of two variables with and without constraints, Radius, Center and Circle of Curvature - Evolutes and Envelopes.

UNIT-III :

Curve tracing - Cartesian, polar and parametric curves. Applications of integration to lengths, volumes and surface areas in Cartesian and Polar coordinates.

UNIT-IV :

Differential equations of first order and first degree - formation. Exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law of natural growth and decay, Orthogonal trajectories, Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomial in x , $e^{V(x)}$, $x^{V(x)}$, method of variation of parameters.

UNIT-V :

Laplace transforms of standard functions - Inverse transform - Linearity - first shifting Theorem. Transforms of derivatives and integrals - Unit step function - second shifting theorem - Dirac's delta function - Differentiation and integration of transforms - Multiple integrals: Double and triple integrals -change of variables – Change of order of integration.

UNIT-VI :

Vector Differential Calculus: Gradient, Divergence, Curl and their related properties of sums, Products,

Laplacian and second order operators. Vector integral Calculus: Vector integration - Line integral - work done -Potential function - area, surface and volume integrals. Green's theorem, Stoke's and Gauss'

Divergence Theorem. Verification of Green's, Stoke's and Gauss'Theorems. Curvilinear Coordinates - Cylindrical, Spherical Coordinates – Expressions of Grad, div, curl in Spherical, Cylindrical and Curvilinear Coordinates.

UNIT-7:

Matrices — brief review — Inverse of a matrix by adjoint , elementary row transformations — Rank - Normal form — eachelon form. Augmented matrix— Consistency — Solution of system of simultaneous linear homogeneous and non-homogeneous equations.

UNIT-8:

Eigen values, Eigen vectors — properties — Cayley-Hamilton Theorem (Inverse and powers of a matrix by Cayley-Hamilton theorem). Quadratic forms — positive, negative definite — Diagonalization of matrix. Calculation of powers of matrix — Modal and spectral matrices. Real matrices — Symmetric, skew-symmetric, orthogonal. Linear Transformation — Orthogonal Transformation. Quadratic forms — Reduction of quadratic form to canonical form — index — signature.

Complex matrices Hermitian, Skew-Hermitian and Unitary — Eigen values and eigen vectors of complex matrices and their properties.

TEXT BOOKS:

1. Iyengar, Krishna Gandhi, "A Text Book of Engineering Mathematics", Vol-1, 2002, S.Chand.
2. B.V. Ramana, "Engineering Mathematics", 2002, TMH.
3. C. Sanakraiah, "Engineering Mathematics – I", 2002, Vijaya.
4. P. Nageswara Rao, Y. Narsimhulu, Prabhakara Rao, "Engineering Mathematics I", 2002.

REFERENCE BOOKS:

1. S. K. V. S. Sri Rama Chary, M. Bhujanga Rao, Shankar, "Engineering Mathematics", 2000, BSP
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 8e, 2001, John Wiley.
3. Michael D. Green Berg, "Advanced Engineering Mathematics", 2e, PHI.
4. Sarveswara Rao Koneru, "Engineering Mathematics", 2002, Orient Longman.
5. N. P. Bali, "Engineering Mathematics – I", Laxmi.

(C1 BS02) MATHEMATICS – II
(Common to Civil, EEEI, Mechanical and ECE)

UNIT – I

Formation of Partial differential equations by elimination of arbitrary constants and arbitrary functions - solutions of standard first order equations of type I, II, III and IV. Solution of one-dimensional heat equation, one-dimensional wave equation and two-dimensional Laplace's equation by the method of separation of variables.

UNIT –II

Fourier integral theorem- Finite and infinite Fourier Transform – Inverse Transforms – Solution to initial boundary value problems. – Z – Transforms. – Inverse Z – Transforms. – Simple Properties – solution of difference equations.

UNIT –III

Complex functions – Continuity – differentiability – Analyticity – Cauchy – Riemann Equations in Cartesian and polar coordinates. Harmonic and Conjugate harmonic functions.

UNIT –IV

Elementary functions and their properties of $\sin Z$, $\cos Z$, e^z , $\log Z$, $\cosh Z$, $\sinh Z$. Line integral – Cauchy's Integral Theorem – Cauchy's Integral formula – derivative of analytic functions – Taylor's and Laurent's Series. Zeros and Poles,

UNIT –V

Residue- Residue theorem – Evaluation of standard real integrals – Argument principle – Rouché's theorem and Fundamental theorem of algebra.

Conformal mapping of function Z^n , $\sin Z$, $\cos Z$, e^z , $\log Z$.
Bilinear Transformation.

UNIT –VI

Numerical Methods-I:

Iterative methods, bisection, Regula false position, Newton-Raphson. – successive approximation methods. Solution of linear simultaneous algebraic equations – Gauss – Jordan and Gauss – Seidel's methods.

UNIT –VII

Numerical Methods-II:

Interpolation. Forward differences – backward differences and central differences. Interpolation Methods. Least square approximation of functions – Linear regression – Polynomial regression.

UNIT –VIII

Numerical Methods-III:

Numerical interpolation by Trapezoidal and Simpson's $1/3$ and $3/8^{\text{th}}$ rules – Numerical solution of differential equations by Euler's method – Runge – Kutta methods – Milne's predictor – Corrector methods.

Recommended Text Books

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| 1. Engineering Mathematics | by B.V., Ramana, TMH, Second Edition – 2004. |
| 2. Engineering Mathematics-I | by Iyengar, Krishna Gandhi et.al, S. Chand, 2002. |
| 3. Engineering Mathematics-II | by C. Sankaraiah, Vijaya Publication 2002. |
| 4. Numerical Methods | by S.S.Sastry, Prentice-Hall. |

B.Tech. (CCC) I/IV YEAR

C1 CS12

PROGRAMMING AND DATA STRUCTURES

UNIT-I : Computer awareness -- qualitative treatment only

Computers : Capabilities , types of computers , Application areas , functional block diagram , central processing unit , functions of ALU and control unit in CPU. Microprocessors CIRC/RISC processor. Address word , RAM , ROM cache memory, associate memory. Magnetic disc , tape , floppy , optical disc, address bus , data bus. Functions of I-O devices , key board , mouse , light pen , printers , monitors , plat panel display unit. Machine language , assembly language , high level language. Compiler , assembler , operating system , types of operating systems , number system algorithm , flow chart.

UNIT-II : Computer programming in C – I :

Basic structure of C program. C tokens , data types , variable declaration , assigning values , operators in C , expressions , evaluation , input-output operations , IF and SWITCH statements , WHILE , DO-WHILE and FOR statements , C programs covering all the above aspects.

UNIT-III : Computer programming in C-II :

String variables in C , declaration , reading , writing , functions in C , user defined functions , category of functions , string handling functions , nesting of functions , recursion , variables and storage classes , structures , arrays , unions , pointers , C programs covering all the above aspects.

UNIT-IV : Computer programming in C-III :

File management in C , opening , closing , reading , writing , and I-O operations on files , file copy program , string I-O in files , detecting errors in reading / writing , C programs covering all the above aspects.

UNIT-V : Introduction to Graphics in C :

Text mode Vs Graphics mode , text in graphics mode , drawing lines , various geometric figures , filling using simple graphics functions in C.

UNIT -VI

One dimensional and multi-dimensional arrays, initialization, application, applications, program examples. Single linked list, double linked list, header, circular list, applications program examples.

UNIT -VII

Stacks, representation, infix, postfix and prefix programs, recursion, recursion in C, applications of stacks. Queues, representation queues, circular queues applications, program examples.

UNIT -VIII

Binary tree, representation, tress traversals. Graph, representation graph trasversals, spanning trees. Searching techniques. linear and binary search methods. Sorting method exchange sort, selection sort, quick sort, tree sort, C programs.

Text Books:

1. Programming in ANSI-C: E. Balaguru Swamy, TMH
2. Numerical Methods: V.Rajaraman

Reference Books :

1. Computer and commonsense : Shelly & Hunt / PHI
2. Programming in C : D.Ravichandra / New age
3. Programming in C: Schaum series
4. Let us C : Yeshwant Kanetkar
5. Mastering Turbo C : Stankelly – Bootle / BPB
6. Numerical Methods : V.Rajaraman
7. Introduction to Computers: P.Radhakrishna / Hi-Tech.

(C1ME01) METALLURGY & MATERIAL SCIENCE

UNIT-I

Structure of Metals : Bonds in solids , space lattices , crystal systems and crystal structure of metals , Miller indices , Miller Bravais indices , crystallisation of metals , grain and grain boundaries, crystal defects.

UNIT-II

Constitution of Alloys : Necessity of alloying , types of solid solutions , Hume-Rothery rules , intermediate alloy phases and electron compounds.

Equilibrium of Alloys : Experimental methods of construction of equilibrium diagrams , Isomorphous alloy systems , equilibrium cooling and heating of alloys , Lever rule , coring miscibility gaps , eutectic systems , congruent melting intermediate phases , peritectic reaction. Transformations in the solid state allotropy , order-disorder transformation , eutectoid , peritectoid reactions , phase rule , relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni , Al-Cu , Bi-Cd , Cu-Zn , Cu-Sn and Fe-Fe₃C.

UNIT-III

Cast irons and steel: Structure and properties of white cast iron, Malleable cast iron, grey cast iron, spheroidal graphite cast iron, alloy cast irons.

UNIT-IV

Classification of steels, structure and properties of plain carbon steels, low alloy steels, high speed steels, tool and die steels.

UNIT-V

Heat treatment of alloys: Effect of alloying elements on Fe-Fe₃C system, Annealing, normalizing, Hardening, TTT diagrams tempering, Hardenability surface hardening methods, Age hardening treatment.

UNIT-VI

Non-ferrous Metals and Alloys: Structures and properties of copper and alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT-VII

Mechanical and Thermal properties of materials: Methods of Hardness testing like Brinell, Vickers and Rockwell tests, Mechanism of elastic action, Linear elastic properties, stress-strain curves, tensile properties, Charpy and Izod impact testing, Fatigue tests, S-N curve, Fatigue failure, creep curve, creep tests. Thermal properties like specific heat, thermal expansion, and thermal shock resistance.

UNIT-VIII

Ceramic materials: Crystalline ceramics, glasses, cermets, abrasive materials. Composite materials: Classification of composites, various methods of component manufacture of composites, particle-reinforced materials, Fibre reinforced materials, metal-ceramic mixtures, Metal-matrix composites and C-C composites.

Text Book:

1. Metallurgy & Materials Science – by V.N. Kodgire

Reference Books:

1. Introduction to Physical Metallurgy: Sidney H. Avener.
2. A First Course in Materials Science: V.Raghavan.

(C1 CE10) ADVANCED STRENGTH OF MATERIALS

UNIT-I

PRINCIPAL STRESSES AND PRINCIPAL PLANE :

Stresses on two mutually perpendicular planes – Normal stress and tangential stresses – principal stresses and principal planes and their directions. Mohr's circle – Determination of stresses on any plane – principal planes and principal stresses. Principal stress – strain Energy.

UNIT-II

THEORIES OF FAILURE :

Principal stress theory – Principal strain theory – Principal strain energy theory – maximum shear strain energy theory.

UNIT-III

THICK CYLINDERS AND WIRE WOUND THIN CYLINDERS :

Lame's Equation – Hoop stress and radial stress. Compound cylinders – Shrink fit pressure. Wire wound cylinders – Design of thick cylinders by various theories.

UNIT-IV

TORSION AND SPRINGS :

circular sections – Theory of Torsion – Solid, hollow and compound sections. Transmission of H.P. combined bending and torsion – Design of shafts by various theories. Close coiled springs – Axial load and axial moments.

UNIT-V

COLUMNS AND STRUTS :

Theory of buckling – Euler's formula – various conditions – Rankine's formula – Empirical formula. Eccentrically loaded columns – Rankine's empirical formula – Secant formula. Laterally loaded columns. Computation of stresses in hooks and bends.

UNIT-VI

SHEAR CENTRE :

Shear center for various standard sections.

UNIT-VII

UNSYMMETRICAL BENDING :

Centroidal principal axes of a section – Moments of inertia referred to any set of rectangular axis – Graphical methods for locating principal axes. Resolution of bending moments into two components along principal axes – Resolution of bending moment into any two rectangular axis through the centroid stress – stresses in beams – location of neutral axis – Deflection of beams under unsymmetrical bending.

UNIT-VIII

ANALYSIS OF PIN JOINTED PLANE TRUSSES:

Method of joints. Method of sections.

Text Book:

1. Strength of materials : by S. Ramamrutham

Reference books

1. Strength of materials and Theory of structures Vol. I : by B.C. Punmia
2. Strength of materials : by Timoshenko and Yung
3. Strength of materials : by Junnarkar

(C1EC16) INDUSTRIAL ELECTRONICS

UNIT-I

SEMI CONDUCTOR THEORY : Energy levels , intrinsic and extrinsic semiconductors , Mobility , diffusion and drift current. Hall effect. S.C. diode and Zener diode characteristics.
RECTIFIERS : Half wave and Full wave rectifiers , without and with filter.

UNIT-II

REGULATORS AND INVERTERS : Transistorized and IC regulators . Simple inverter circuits.
TRANSISTORS : Construction and current components in transistors CB , CE , characteristics and parameters.
SCR , TRIAC , DIAC , FET , UJT : Construction and characteristics.

UNIT-III

CONTROLLED RECTIFIERS WITH SCRS : Gate control and phase control methods.
SIMPLE AMPLIFIER CIRCUITS WITH TRANSISTORS : and FETs. RC coupled Amplifiers : Class A , Class B , Class C Amplifiers.
FEEDBACK AMPLIFIERS : Properties of Negative feedback amplifiers , Oscillators: LC type and RC type and crystal oscillators.

UNIT-IV

PHOTO ELECTRIC PHENOMENON : Photo diodes , photo transistors , photo multipliers , A.C. operated photo electric relay , LEDs ,LCDs.
DISPLAY SYSTEMS : Alphanumeric , Dot matrix , seven segment and Plasma displays , Industrial applications.

UNIT-V

CATHODE RAY TUBES : Constructional details , Deflection methods , Time base circuits , uses of a C.R.O.
TIMERS : Basic timing circuits , D.C operated timer , A.C. operated timer circuits.
RESISTANCE WELDING : Ignition contractor circuits , Simple welding circuits , sequence timer circuits for welding , synchronous welding circuits , Energy storage welding circuits.

UNIT-VI

INDUCTION HEATING : Theory of induction heating , Application in industries.
DIELECTRIC HEATING : Theory of dielectric heating and its industrial applications.
ULTRASONICS : Generator for ultrasonic oscillations , Flow detection and other applications.

UNIT-VII

MEASUREMENTS OF NON-ELECTRIC QUANTITIES : Transducers , Measurement of elongation , displacement , Force , Pressure , temperature and light.

UNIT-VIII

Operational Amplifiers for mathematical operations , Analogy computer , solution of differential equations.

Basic Digital Circuits , Gates , Flip flops , Block diagram of a digital computer.

Semiconductor memories RAMs , ROMs , computer organization , digital computers, functions of different parts of digital computer.

TEXT BOOKS :

1. Industrial Electronics : G.K. Mittal.
2. Electronic Devices : Milliman and Halkias.
3. Transducers and Display Systems : B.S. Sarde

REFERENCE :

1. Electronics Devices and Circuits : Y.N. Bagat

(C1 CS13) COMPUTER LAB

1. Write a C program that prints the given 3 integers in ascending order using IF-ELSE.
2. Write a C program to find the sum of $1+2+3+\dots+n$ using
(i) While (ii) do-while (iii) for loop
3. Write a C program to find the product of two matrices.
4. Write a function that will scan a character string passed as an argument and convert all lower case characters into their upper case equivalents.
5. Write a program to print the sum of Fibonacci series up to 10th term. The Fibonacci sequence of numbers is 1,1,2,3,5,8,- - based on the recurrence Relations $F(n) = f(n-1) + f(n-2)$ for $n > 2$.
6. Write a C program to display menu and accept options using switch statement.
7. Write a C program to extract a portion of a character string and print the extracted string.
8. Write a C program to swap two elements using the pointer concept.
9. Write a C program to accept the elements of the structure. (i) Student's name
(ii) Hostel (iii) Mess fee and display the same structure along with telephone bill , medical bill and gross bill.
10. Write a C program to animate a circle.
11. Write a C program to implement false position method and find one smallest root of the following equation to 3 significant digits. $F(x) = x \sin x + \cos x = 0$
12. Write a C program to find the root of the equation $X^3 + 4X + 3 = 0$ to 3 significant digits using Newton-Raphson method.
13. Write a C program to implement Newton Gregory forward difference interpolation formula.
14. Write a C program to implement linear regression.
15. Write a C program to implement Gauss-Jordan method.
16. Write a C program to implement Gauss-siedel method
17. Write a C program to evaluate the integral
$$S = \int_0^5 e^{-x} dx$$
 using Trapezoidal rule with 20 points.
18. Write a C program to evaluate the integral
$$S = \int_0^5 X^3 e^{x-1} dx$$
 using Simpson's rule with 10 points.
19. Write a C program to solve the following differential equation using Runge-Kutta fourth order method.
 $dx/dx = x^2 + y^2$, $y(0) = 1$ solution require for $1 > x > 0$
20. Write a C program to implement the Milne's predictor- corrector formula.

(C1 ME02) METALLURGY AND MATERIAL SCIENCE LAB

Note: Any six of the following experiments from each section be conducted.

Section A

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high carbon steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardeneability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

Section B

1. Polishing of Nonferrous specimen for metallographic observation.
2. Polishing of ferrous specimen for metallographic observation.
3. Mounting of specimen on thermosetting material.
4. Hardness test by using Brinel Hardness testing machine.
5. Hardness test by using Rockwell Hardness testing machine.
6. Nondestructive test by magnaflux method.
7. Study of microstructure of different materials.
8. Study of crystal structures – Simple cube – BCC – FCC – CPH
