

With effect from 02/08/2016

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B.TECH. COURSE STRUCTURE (2016-17)**

(Common for Civil, ME, AE, ME (M), MME, AU, Mining, Petroleum, CEE, ME (Nanotech))

**I YEAR I SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	MA101BS	Mathematics-I	3	1	0	3
2	MA102BS	Mathematics-II	4	1	0	4
3	PH103BS	Engineering Physics	3	0	0	3
4	CS104ES	Computer Programming in C	3	0	0	3
5	ME105ES	Engineering Mechanics	3	0	0	3
6	ME106ES	Engineering Graphics	2	0	4	4
7	PH107BS	Engineering Physics Lab	0	0	3	2
8	CS108ES	Computer Programming in C Lab	0	0	3	2
9	*EA109MC	NSS	0	0	0	0
		<b>Total Credits</b>	<b>18</b>	<b>2</b>	<b>10</b>	<b>24</b>

**I YEAR II SEMESTER**

S. No	Course Code	Course Title	L	T	P	Credits
1	AP201BS	Applied Physics	3	0	0	3
2	CH202BS	Engineering Chemistry	4	0	0	4
3	MA203BS	Mathematics-III	4	1	0	4
4	EN204HS	Professional Communication in English	3	0	0	3
5	EE205ES	Basic Electrical & Electronics Engineering	4	0	0	4
6	CH206BS	Engineering Chemistry Lab	0	0	3	2
7	EN207HS	English Language Communication Skills Lab	0	0	3	2
8	ME208ES	Engineering Workshop	0	0	3	2
9	*EA209MC	NCC/NSO	0	0	0	0
		<b>Total Credits</b>	<b>18</b>	<b>1</b>	<b>9</b>	<b>24</b>

\*Mandatory Course

**MATHEMATICS- I**  
**(Linear Algebra and Differential Equations)**

**B.Tech. I Year I Sem.**  
Course Code: **MA101BS**

**L T/P/D C**  
**3 1/0/0 3**

**Prerequisites:** Foundation course (No prerequisites).

**Course Objectives:**

To learn

- types of matrices and their properties
- the concept of rank of a matrix and applying the same to understand the consistency
- solving the linear systems
- the concepts of eigen values and eigen vectors and reducing the quadratic forms into their canonical forms
- partial differentiation, concept of total derivative
- finding maxima and minima of functions of two variables
- methods of solving the linear differential equations of first and higher order
- the applications of the differential equations
- formation of the partial differential equations and solving the first order equations.

**Course Outcomes:**

After learning the contents of this paper the student must be able to

- write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
- find the Eigen values and Eigen vectors which come across under linear transformations
- find the extreme values of functions of two variables with/ without constraints.
- identify whether the given first order DE is exact or not
- solve higher order DE's and apply them for solving some real world problems

**UNIT-I**

**Initial Value Problems and Applications**

Exact differential equations - Reducible to exact.

Linear differential equations of higher order with constant coefficients: Non homogeneous terms with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}V(x)$ ,  $xV(x)$ - Operator form of the differential equation, finding particular integral using inverse operator, Wronskian of functions, method of variation of parameters.

Applications: Newton's law of cooling, law of natural growth and decay, orthogonal trajectories, Electrical circuits.

**UNIT-II**

**Linear Systems of Equations**

Types of real matrices and complex matrices, rank, echelon form, normal form, consistency and solution of linear systems (homogeneous and Non-homogeneous) - Gauss elimination, Gauss Jordan and LU decomposition methods- Applications: Finding current in the electrical circuits.

### **UNIT-III**

#### **Eigen values, Eigen Vectors and Quadratic Forms**

Eigen values, Eigen vectors and their properties, Cayley - Hamilton theorem (without proof), Inverse and powers of a matrix using Cayley - Hamilton theorem, Diagonalization, Quadratic forms, Reduction of Quadratic forms into their canonical form, rank and nature of the Quadratic forms – Index and signature.

### **UNIT-IV**

#### **Partial Differentiation**

Introduction of partial differentiation, homogeneous function, Euler's theorem, total derivative, Chain rule, Taylor's and Mclaurin's series expansion of functions of two variables, functional dependence, Jacobian.

Applications: maxima and minima of functions of two variables without constraints and Lagrange's method (with constraints)

### **UNIT-V**

#### **First Order Partial Differential Equations**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, Lagranges method to solve the first order linear equations and the standard type methods to solve the non linear equations.

#### **Text Books:**

1. A first course in differential equations with modeling applications by Dennis G. Zill, Cengage Learning publishers.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.

#### **References:**

1. Advanced Engineering Mathematics by E. Kreyszig, John Wiley and Sons Publisher.
2. Engineering Mathematics by N. P. Bali, Lakshmi Publications.

## MATHEMATICS- II (Advanced Calculus)

**B.Tech. I Year I Sem.**

Course Code: MA102BS/MA202BS

**L T/P/D C**  
**4 1/0/0 4**

**Prerequisites:** Foundation course (No prerequisites).

### **Course Objectives:**

To learn

- concepts & properties of Laplace Transforms
- solving differential equations using Laplace transform techniques
- evaluation of integrals using Beta and Gamma Functions
- evaluation of multiple integrals and applying them to compute the volume and areas of regions
- the physical quantities involved in engineering field related to the vector valued functions.
- the basic properties of vector valued functions and their applications to line, surface and volume integrals.

### **Course Outcomes:**

After learning the contents of this course the student must be able to

- use Laplace transform techniques for solving DE's
- evaluate integrals using Beta and Gamma functions
- evaluate the multiple integrals and can apply these concepts to find areas, volumes, moment of inertia etc of regions on a plane or in space
- evaluate the line, surface and volume integrals and converting them from one to another

### **UNIT-I**

**Laplace Transforms:** Laplace transforms of standard functions, Shifting theorems, derivatives and integrals, properties- Unit step function, Dirac's delta function, Periodic function, Inverse Laplace transforms, Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

### **UNIT-II**

**Beta and Gamma Functions:** Beta and Gamma functions, properties, relation between Beta and Gamma functions, evaluation of integrals using Beta and Gamma functions.

Applications: Evaluation of integrals.

### **UNIT-III**

**Multiple Integrals:** Double and triple integrals, Change of variables, Change of order of integration.

Applications: Finding areas, volumes & Center of gravity (evaluation using Beta and Gamma functions).

#### **UNIT–IV**

**Vector Differentiation:** Scalar and vector point functions, Gradient, Divergence, Curl and their physical and geometrical interpretation, Laplacian operator, Vector identities.

#### **UNIT–V**

**Vector Integration:** Line Integral, Work done, Potential function, area, surface and volume integrals, Vector integral theorems: Greens, Stokes and Gauss divergence theorems (without proof) and related problems.

#### **Text Books:**

1. Advanced Engineering Mathematics by R K Jain & S R K Iyengar, Narosa Publishers
2. Engineering Mathematics by Srimanthapal and Subodh C. Bhunia, Oxford Publishers

#### **References:**

1. Advanced Engineering Mathematics by Peter V. O. Neil, Cengage Learning Publishers.
2. Advanced Engineering Mathematics by Lawrence Turyn, CRC Press

## ENGINEERING PHYSICS/ENGINEERING PHYSICS - I

**B.Tech. I Year I Sem.**  
Course Code: **PH103BS**

**L T/P/D C**  
**3 0/0/0 3**

### Course Objectives:

- To understand interaction of light with matter through interference, diffraction and polarization.
- To able to distinguish ordinary light with a laser light and to realize propagation of light through optical fibers.
- To understand various crystal systems and there structures elaborately.
- To study various crystal imperfections and probing methods like X-RD.

**Course outcomes:** after completion of this course the student is able to

- Realize the importance of light phenomena in thin films and resolution.
- Learn principle, working of various laser systems and light propagation through optical fibers.
- Distinguish various crystal systems and understand atomic packing factor.
- Know the various defects in crystals.

### UNIT-I

**Interference:** Coherence, division of amplitude and division of wave front, interference in thin films (transmitted and reflected light), Newton's rings experiment.

**Diffraction:** Distinction between Fresnel and Fraunhofer diffraction, diffraction due to single slit, N-slits, Diffraction grating experiment.

### UNIT-II

**Polarization:** Introduction, Malus's law, double refraction, Nicol prism, Quarter wave and half wave plates.

**Lasers:** Characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein coefficients, population inversion, ruby laser, helium – neon laser, semi conductor laser, applications of lasers

### UNIT-III

**Fiber Optics:** Principle of optical fiber, construction of fiber, acceptance angle and acceptance cone, numerical aperture, types of optical fibers: step index and graded index fibers, attenuation in optical fibers, applications of optical fibers in medicine and sensors.

### UNIT-IV

**Crystallography:** Space lattice, unit cell and lattice parameters, crystal systems, Bravais lattices, atomic radius, co-ordination number and packing factor of SC, BCC, FCC, HCP and diamond, Miller indices, crystal planes and directions, inter planar spacing of orthogonal crystal systems.

### UNIT-V

**X-ray Diffraction and Defects in Crystals:** Bragg's law, X-ray diffraction methods: Laue method, powder method; point defects: vacancies, substitutional, interstitial, Frenkel and

Schottky defects, line defects (qualitative) and Burger's vector, surface defects: stacking faults, twin, tilt and grain boundaries.

**Text Books:**

1. Physics Vol. 2, Halliday, Resnick and Kramer John wiley and Sons, Edition 4.
2. Modern Engineering Physics, K. Vijaya Kumar and S. Chandra Lingam, S. Chand and Co. Pvt. Ltd.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Student edition.

**Reference Books:**

1. X-Ray Crystallography, Phillips, John Wiley publishers.
2. Waves, Frank S Crawford Jr, Berkeley Physics course, Volume 3.
3. Solid State Physics, AJ Dekker, MacMilan Publishers.
4. Introduction to Crystallography, Phillips, John Wiley publishers.

## COMPUTER PROGRAMMING IN C

**B.Tech. I Year I Sem.**

Course Code: CS104ES/CS204ES

**L T/P/D C**

**3 0/0/0 3**

### **Course Objectives:**

- To learn the fundamentals of computers.
- To understand the various steps in Program development.
- To learn the syntax and semantics of C Programming Language.
- To learn how to write modular and readable C Programs.
- To learn to write programs using structured programming approach in C to solve problems.

### **Course Outcomes:**

- Demonstrate the basic knowledge of computer hardware and software.
- Ability to write algorithms for solving problems.
- Ability to draw flowcharts for solving problems.
- Ability to code a given logic in C programming language.
- Gain knowledge in using C language for solving problems.

### **UNIT - I**

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development, algorithms and flowcharts , Number systems-Binary, Decimal, Hexadecimal and Conversions, storing integers and real numbers.

Introduction to C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators(Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements(making decisions) – if and switch statements, Repetition statements ( loops)-while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Program examples.

### **UNIT - II**

Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs.

Arrays – Concepts, using arrays in C, inter function communication, array applications- linear search, binary search and bubble sort, two – dimensional arrays, multidimensional arrays, C program examples.

### **UNIT - III**

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions.

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

## **UNIT - IV**

Enumerated, Structure ,and Union Types– The Type Definition (typedef), Enumerated types, Structures –Declaration, initialization, accessing structures, operations on structures, Complex structures-Nested structures, structures containing arrays, structures containing pointers, arrays of structures, structures and functions, Passing structures through pointers, self referential structures, unions, bit fields, C programming examples, command–line arguments, Preprocessor commands.

## **UNIT – V**

Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions (fseek ,rewind and ftell), C program examples.

### **Text books:**

- 1) Computer Science: A Structured Programming Approach Using C, B.A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
- 2) Programming in C. P. Dey and M Ghosh , Second Edition, Oxford University Press.

### **Reference books:**

- 1) The C Programming Language, B.W. Kernighan and Dennis M. Ritchie, Second Edition, Pearson education.
- 2) Programming with C, B. Gottfried, 3<sup>rd</sup> edition, Schaum's outlines, McGraw Hill Education (India) Pvt Ltd.
- 3) C From Theory to Practice, G S. Tselikis and N D. Tselikas, CRC Press.
- 4) Basic computation and Programming with C, Subrata Saha and S. Mukherjee, Cambridge University Press.

## ENGINEERING MECHANICS

**B.Tech. I Year I Sem.**  
Course Code: **ME105ES**

**L T/P/D C**  
**3 0/0/0 3**

**Pre Requisites:** None

### **Course Objectives:**

- To understand the resolving forces and moments for a given force system
- To analyze the types of friction for moving bodies and problems related to friction.
- To determine the centroid and second moment of area

### **UNIT-I**

**Introduction to Mechanics:** Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

### **UNIT-II**

**Friction:** Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions -Motion of Bodies –Wedge Screw, Screw-jack and differential screw –jack.

### **UNIT-III**

**Centroid and Center of Gravity:** Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus -Centre of Gravity of Bodies – Centroids of Volumes – Center of gravity of composite bodies.

**Area moments of Inertia:** Introduction – Definition of Moment of Inertia -Polar Moment of Inertia – Radius of gyration. Transfer Theorem for moment of inertia – Moments of inertia by integration - Moments of Inertia of Composite Figures, Product of Inertia, Transfer Formula for Product of Inertia.

### **UNIT-IV**

**Mass Moment of Inertia:** Introduction - Moment of Inertia of Masses – Radius of gyration - Transfer Formula for Mass Moments of Inertia – Mass moments of inertia by integration - Mass moment of inertia of composite bodies.

**Virtual Work:** Theory of virtual work-Application.

### **UNIT-V**

**Kinetics:** Kinetics of a particle-D'Alemberts principle-Motion in a curved path – work, energy and power. Principle of conservation of energy- Kinetics of rigid body in translation, rotation-work done-Principle of work-energy-Impulse-momentum.

**Mechanical Vibrations:** Definitions, Concepts-Simple Harmonic motion- free vibrations-Simple and compound pendulums

### **Text Books:**

1. Singer's Engineering Mechanics Statics and Dynamics/ K. Vijaya Kumar Reddy, J. Suresh Kumar/ BSP
2. Engineering Mechanics/ Irving Shames, G. Krishna Mohan Rao / Prentice Hall

3. Foundations and applications of Engineering Mechanics by HD Ram and AK Chouhan, Cambridge publications.

**References:**

1. A Text of Engineering Mechanics /YVD Rao/ K. Govinda Rajulu/ M. Manzoor Hussain / Academic Publishing Company
2. Engineering Mechanics / Bhattacharyya/ Oxford.

## ENGINEERING GRAPHICS

**B.Tech. I Year I Sem.**

Course Code: ME106ES/ME205ES

**L T/P/D C**

**2 0/0/4 4**

**Pre-requisites:** None

**Course objectives:**

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

**Course Outcomes:**

- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

**UNIT – I**

**Introduction to Engineering Drawing:** Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid Involute. Scales – Plain, Diagonal and Vernier Scales.

**UNIT- II**

**Orthographic Projections:** Principles of Orthographic Projections – Conventions – Projections of Points and Lines Projections of Plane regular geometric figures.—Auxiliary Planes.

**UNIT – III**

Projections of Regular Solids – Auxiliary Views.

**UNIT – IV**

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere. Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

**UNIT – V**

**Isometric Projections:** Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions Auto CAD: Basic principles only.

**Text books:**

- Engineering Drawing / Basant Agrawal and Mc Agrawal/ Mc Graw Hill
- Engineering Drawing/ M.B. Shah, B.C. Rane / Pearson.

**Reference books:**

- Engineering Drawing / N.S. Parthasarathy and Vela Murali/ Oxford
- Engineering Drawing N.D. Bhatt / Charotar

## ENGINEERING PHYSICS LAB

**B.Tech. I Year I Sem.**

Course Code: **PH107BS/PH207BS**

**L T/P/D C**

**0 0/3/0 2**

**(Any TEN experiments compulsory)**

- 1) Dispersive power of the material of a prism – Spectrometer.
- 2) Determination of wavelengths of white source – Diffraction grating.
- 3) Newton's Rings – Radius of curvature of Plano convex lens.
- 4) Melde's experiment – Transverse and longitudinal modes.
- 5) Charging, discharging and time constant of an R-C circuit.
- 6) L-C-R circuit – Resonance & Q-factor.
- 7) Magnetic field along the axis of current carrying coil – Stewart and Gees method and to verify Biot – Savart's law.
- 8) Study the characteristics of LED and LASER diode.
- 9) Bending losses of fibres & Evaluation of numerical aperture of a given fibre.
- 10) Energy gap of a material of p-n junction.
- 11) Torsional pendulum – Rigidity modulus.
- 12) Wavelength of light, resolving power and dispersive power of a diffraction grating using laser.
- 13) V-I characteristics of a solar cell.

## COMPUTER PROGRAMMING IN C LAB

**B.Tech. I Year I Sem.**

Course Code: CS108ES/CS208ES

**L T/P/D C**

**0 0/3/0 2**

### Course Objective:

- To write programs in C using structured programming approach to solve the problems.

### Course Outcomes

- 1. Ability to design and test programs to solve mathematical and scientific problems.
- 2. Ability to write structured programs using control structures and functions.

### Recommended Systems/Software Requirements:

- Intel based desktop PC
- GNU C Compiler

- a) Write a C program to find the factorial of a positive integer.
  - b) Write a C program to find the roots of a quadratic equation.
- a) Write a C program to determine if the given number is a prime number or not.
  - b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- a) Write a C program to construct a pyramid of numbers.
  - b) Write a C program to calculate the following Sum:  
$$\text{Sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$
- a) The least common multiple (lcm) of two positive integers a and b is the smallest integer that is evenly divisible by both a and b. Write a C program that reads two integers and calls lcm (a, b) function that takes two integer arguments and returns their lcm. The lcm (a, b) function should calculate the least common multiple by calling the gcd (a, b) function and using the following relation:  
$$\text{LCM}(a,b) = ab / \text{gcd}(a,b)$$
  - b) Write a C program that reads two integers n and r to compute the ncr value using the following relation:  
$$\text{ncr}(n,r) = n! / r! (n-r)! .$$
 Use a function for computing the factorial value of an integer.
- a) Write C program that reads two integers x and n and calls a recursive function to compute  $x^n$
  - b) Write a C program that uses a recursive function to solve the Towers of Hanoi problem.
  - c) Write a C program that reads two integers and calls a recursive function to compute ncr value.
- a) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user using Sieve of Eratosthenes algorithm.
  - b) Write a C program that uses non recursive function to search for a Key value in a given list of integers. Use linear search method.
- a) Write a menu-driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.
  - b) Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers. Use binary search method.

8. a) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.  
b) Write a C program that reads two matrices and uses functions to perform the following:
  - i) Addition of two matrices
  - ii) Multiplication of two matrices
9. a) Write a C program that uses functions to perform the following operations:
  - i) to insert a sub-string into a given main string from a given position.
  - ii) to delete n characters from a given position in a given string.b) Write a C program that uses a non recursive function to determine if the given string is a palindrome or not.
10. a) Write a C program to replace a substring with another in a given line of text.  
b) Write a C program that reads 15 names each of up to 30 characters, stores them in an array, and uses an array of pointers to display them in ascending (ie. alphabetical) order.
11. a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.  
b) Write a C program to convert a positive integer to a roman numeral. Ex. 11 is converted to XI.
12. a) Write a C program to display the contents of a file to standard output device.  
b) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
13. a) Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command-line arguments.  
b) Write a C program to compare two files, printing the first line where they differ.
14. a) Write a C program to change the nth character (byte) in a text file. Use fseek function.  
b) Write a C program to reverse the first n characters in a file. The file name and n are specified on the command line. Use fseek function.
15. a) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).  
b) Define a macro that finds the maximum of two numbers. Write a C program that uses the macro and prints the maximum of two numbers.

#### Reference Books:

1. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publishers.
2. Computer Programming in C, V. Rajaraman, PHI.
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. C++: The complete reference, H. Schildt, TMH Publishers.