**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

**KAKINADA – 533 003, Andhra Pradesh, India**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

# COURSE STRUCTURE AND SYLLABUS

### For

## B. Tech COMPUTER SCIENCE &ENGINEERING

*(Applicable for batches admitted from 2019-2020)*

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA**

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## COURSE STRUCTURE - R19

### I  Year – I SEMESTER

| S. No | Course Code | Subjects | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | HS1101 | English | 3 | 0 | 0 | 3 |
| 2 | BS1101 | Mathematics - I | 3 | 0 | 0 | 3 |
| 3 | BS1106 | Applied Chemistry | 3 | 0 | 0 | 3 |
| 4 | ES1112 | Fundamentals of Computer Science | 3 | 0 | 0 | 3 |
| 5 | ES1103 | Engineering Drawing | 1 | 0 | 3 | 2.5 |
| 6 | HS1102 | English Lab | 0 | 0 | 3 | 1.5 |
| 7 | BS1107 | Applied Chemistry Lab | 0 | 0 | 3 | 1.5 |
| 8 | ES1105 | IT Workshop | 0 | 0 | 3 | 1.5 |
| 9 | MC1101 | Environmental Science | 3 | 0 | 0 | 0 |
| **Total Credits** | | | **16** | **0** | **12** | **19** |

### I  Year – II SEMESTER

| S. No | Course Code | Subjects | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | BS1202 | Mathematics – II | 3 | 0 | 0 | 3 |
| 2 | BS1203 | Mathematics – III | 3 | 0 | 0 | 3 |
| 3 | BS1204 | Applied Physics | 3 | 0 | 0 | 3 |
| 4 | ES1201 | Programming for Problem Solving using C | 3 | 0 | 0 | 3 |
| 5 | ES1213 | Digital Logic Design | 3 | 0 | 0 | 3 |
| 6 | BS1205 | Applied Physics Lab | 0 | 0 | 3 | 1.5 |
| 7 | HS1203 | Communication Skills Lab | 0 | 1 | 2 | 2 |
| 8 | ES1202 | Programming for Problem Solving using C Lab | 0 | 0 | 3 | 1.5 |
| 9 | PR1201 | Engineering Exploration Project | 0 | 0 | 2 | 1 |
| 10 | MC1204 | Constitution of India | 3 | 0 | 0 | 0 |
| **Total Credits** | | | **18** | **1** | **10** | **21** |

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**Open Electives to be offered by CSE for Other Branches:**

| Open Elective I: | Open Elective II: |
|---|---|
| 1. Data Structures | 1. Problem Solving using Python |
| 2. Java Programming | 2. Web Technologies |
| 3. Data Base Management Systems | 3. Machine Learning |
| 4. C++ Programming | 4. Distributed Computing |
| 5. Operating Systems | 5. AI Tools & Techniques |
| 6. Internet of Things | 6. Data Science |
| **Open Elective III:** | |
| 1. Big Data | |
| 2. Image Processing | |
| 3. Mobile Application Development | |
| 4. Cyber Security | |
| 5. Deep Learning | |
| 6. Blockchain Technologies | |

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| I Year  - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| | **MATHEMATICS - II (BS1202)** | | | | |

**Course Objectives:**
- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

**Course Outcomes:**
At the end of the course, the student will be able to
- develop the use of matrix algebra techniques that is needed by engineers for practical applications  (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel  (L3)
- evaluate approximating the roots of polynomial and transcendental equations by different algorithms  (L5)
- apply Newton's forward & backward interpolation and  Lagrange's formulae for equal and unequal intervals (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations  (L3)

**UNIT I:** Solving systems of linear equations, Eigen values and Eigen vectors:          (10 hrs)
Rank of a matrix by echelon form and normal form – Solving system of   homogeneous and non-homogeneous equations linear equations – Gauss Elimination for solving system of equations – Eigen values and Eigen vectors and their properties.

**UNIT-II:** Cayley-Hamilton theorem and Quadratic forms:                          (10 hrs)

Cayley - Hamilton theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (Ref. Book – 1).

**UNIT III:** Iterative methods:                                              (8 hrs)
Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations.

**UNIT IV:** Interpolation:                                                  (10 hrs)
Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

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**UNIT V:** Numerical integration and solution of ordinary differential equations:      (10 hrs)
Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

**Text Books:**

1) B. S. Grewal, Higher Engineering Mathematics, $43^{rd}$ Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

**Reference Books:**

1) David Poole, Linear Algebra- A modern introduction, $4^{th}$ Edition, Cengage.
2) Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
3) M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
4) Lawrence Turyn, Advanced Engineering Mathematics, CRC Press.

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| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| | **MATHEMATICS - III (BS1203)** | | | | |

**Course Objectives:**

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

**Course Outcomes:**

At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

**UNIT I:** Vector calculus:                                                                                          (10 hrs)
Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.
Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

**UNIT II:** Laplace Transforms:                                                                                  (10 hrs)
Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).

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

**UNIT III:** Fourier series and Fourier Transforms:                                                      (10 hrs)
Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.
Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

**UNIT IV:** PDE of first order:                                                                                      (8 hrs)
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

**UNIT V:** Second order PDE and Applications:                                                            (10 hrs)
Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$ .

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

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**Text Books:**
1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

**Reference Books:**
1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3) Peter O' Neil, Advanced Engineering Mathematics, Cengage.
4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

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| I Year  - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| | APPLIED PHYSICS (BS1204) | | | | |

**Course Objectives:**

Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by Jawaharlal Nehru Technological University Kakinada that serves as a transit to understand the branch specific advanced topics.  The course is designed to:

- Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
- Understand the physics of Semiconductors and their working mechanism for their utility in sensors.
- To impart the knowledge of materials with characteristic utility in appliances.

**UNIT I**                                                                                                    (10hrs)

WAVE OPTICS: Principle of Superposition - Interference of light - Conditions for sustained   Interference - Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry).

Diffraction - Fraunhofer Diffraction - Diffraction due to Single slit (quantitative), Double slit, N -slits and circular aperture (qualitative) – Intensity distribution curves - Diffraction Grating – Grating spectrum – missing order – resolving power – Rayleigh's criterion – Resolving powers of Microscope, Telescope and grating (qualitative).

Unit Outcomes: *The students will be able to*

- ➢ explain the need of coherent sources and the conditions for sustained interference.
- ➢ analyze the differences between interference and diffraction with applications.
- ➢ illustrate the resolving power of various optical instruments.

**UNIT II**                                                                                                    (9hrs)

QUANTUM MECHANICS: Introduction – Matter waves – de Broglie's hypothesis – Davisson-Germer experiment – G. P. Thomson experiment – Heisenberg's Uncertainity Principle – interpretation of wave function – Schröedinger Time Independent and Time Dependent wave equations – Particle in a potential box.

Unit Outcomes: *The students will be able to*

- ➢ explain the fundamental concepts of quantum mechanics.
- ➢ analyze the physical significance of wave function.
- ➢ apply Schrödinger's wave equation for energy values of  a free particle .

**UNIT III**                                                                                                    (10hrs)

FREE ELECTRON THEORY & BAND THEORY OF SOLIDS : Introduction – Classical free electron theory (merits and demerits only) - Quantum Free electron theory  – electrical conductivity based on quantum free electron theory – Fermi Dirac distribution function – Temperature dependence of  Fermi-Dirac distribution function - expression for Fermi energy -

Density of states.

Bloch's theorem (qualitative) – Kronig-Penney model(qualitative) – energy bands in crystalline solids – E Vs K diagram – classification of crystalline solids – effective mass of electron – $m^*$ Vs K diagram -  concept of hole.

Unit Outcomes: *The students will be able to*

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➢ explain the various electron theories.
➢ calculate the Fermi energy.
➢ analyze the physical significance of wave function .
➢ interpret the effects of temperature on Fermi Dirac distribution function.
➢ summarise various types of solids based on band theory.

**UNIT IV**                                                                                                  (9hrs)
SEMICONDUCTOR PHYSICS: Introduction – Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Hall effect- Hall coefficient - Applications of Hall effect - Drift and Diffusion currents – Einstein's equation.
Learning Outcomes: *The students will be able to*
➢ classify the energy bands of semiconductors.
➢ outline the properties of n-type and p-type semiconductors.
➢ identify the type of semiconductor using Hall effect.

**UNIT V**                                                                                                  (10 hrs)
MAGNETISM & DIELECTRICS: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Introduction - Dielectic polarization – Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation - Frequency dependence of polarization – Applications of dielectrics.

Unit Outcomes: *The students will be able to*
➢ explain the concept of polarization in dielectric materials.
➢ summarize various types of polarization of dielectrics .
➢ interpret Lorentz field and Claussius- Mosotti relation in dielectrics.
➢ classify the magnetic materials based on susceptibility and their temperature dependence.
➢ explain the applications of dielectric and magnetic materials .
➢ Apply the concept of magnetism to magnetic devices.

**Text Books:**
1) "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand Publications, 2017.
2) "Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3) "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

**Reference Books:**
1) "Engineering Physics" by M. R. Srinivasan, New Age international publishers (2009).
2) "Optics" by Ajoy Ghatak, 6th Edition McGraw Hill Education, 2017.
3) "Solid State Physics" by A. J. Dekker, Mc Millan Publishers (2011).

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| I Year  - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| **PROGRAMMING FOR PROBLEM SOLVING USING C (ES1201)** | | | | | |

**Course Objectives:**
The objectives of Programming for Problem Solving Using C are
- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

**Course Outcomes:**
Upon the completion of the course the student will learn
- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

## UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers
Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.
Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

## UNIT II
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.
Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.
Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

## UNIT III
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code
Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.

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**UNIT IV**
Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.
Processor Commands: Processor Commands.

**UNIT V**
Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions
Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

**Text Books:**
1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2) The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.

**Reference Books:**
1) Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
2) Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
3) Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.

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| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 |
| | **DIGITAL LOGIC DESIGN (ES1213)** | | | | |

**Course objectives:**
- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
- To introduce the basic tools for design of combinational and sequential digital logic.
- To learn simple digital circuits in preparation for computer engineering.

**Course outcomes:**
A student who successfully fulfills the course requirements will have demonstrated:
- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
- Students will be able to design various sequential circuits starting from flip-flop to registers and counters.

**UNIT I:** Digital Systems and Binary Numbers
Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc..

**UNIT II:** Concept of Boolean algebra
Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.
Gate level Minimization
Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, ExclusiveOR Function.

**UNIT III:** Combinational Logic
Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, HDL Models of Combinational Circuits.
Realization of Switching Functions Using PROM, PAL and PLA.

**UNIT IV:** Synchronous Sequential Logic
Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

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**UNIT V:** Registers and Counters

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

**Text Books:**

1) Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2) Fundamentals of Logic Design, 5/e, Roth, Cengage.

**Reference Books:**

1) Digital Logic and Computer Design, M.Morris Mano, PEA.
2) Digital Logic Design, Leach, Malvino, Saha, TMH.
3) Modern Digital Electronics, R.P. Jain, TMH.

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| I Year  - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |
| | **APPLIED PHYSIC LAB (ES1205)** | | | | |

(Any 10 of the following listed 15 experiments)

**LIST OF EXPERIMENTS:**

1) Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2) Newton's rings – Radius of Curvature of Plano - Convex Lens.
3) Determination of thickness of a spacer using wedge film and parallel interference fringes.
4) Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
5) Energy Band gap of a Semiconductor p - n junction.
6) Characteristics of Thermistor   – Temperature Coefficients
7) Determination of dielectric constant by charging and discharging method
8) Determination of resistivity of semiconductor by Four probe method.
9) Study the variation of B versus H by magnetizing the magnetic material ( B-H curve).
10) Measurement of magnetic susceptibility by Gouy's method.
11) Dispersive power of diffraction grating.
12) Resolving Power of telescope
13) Resolving power of grating
14) Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall effect.
15) Variation of dielectric constant with temperature.

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| I Year  - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 2 |
| | **COMMUNICATION SKILLS LAB (HS1203)** | | | | |

### UNIT I
Oral Activity: JAM, Hypothetical Situations, Self/Peer Profile
Common Errors in Pronunciation, Neutralising Accent

### UNIT II
Oral Activity: Telephonic Etiquette, Role Plays
Poster Presentations

### UNIT III
Oral Activity:   Oral Presentation skills, Public speaking
Data Interpretation

### UNIT IV
Oral Activity:   Group Discussions: Do's and Don'ts- Types, Modalities

### UNIT V
Oral Activity: Interview Skills: Preparatory Techniques, Frequently asked questions, Mock Interviews.
Pronunciation: Connected speech (Pausing, Tempo, Tone, Fluency etc.,)

### References:
1) Infotech English, Maruthi Publications (with Compact Disc).
2) Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
3) English Pronunciation in use- Mark Hancock, Cambridge University Press.
4) English Phonetics and Phonology-Peter Roach, Cambridge University Press.
5) English Pronunciation in use- Mark Hewings, Cambridge University Press.
6) English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
7) English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
8) Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
9) Technical Communication- Gajendrea Singh Chauhan, Smita Kashiramka, Cengage Publications.

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| I Year  - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 3 | 1.5 |
| **PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1202)** | | | | | |

**Course Objectives:**
- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

**Course Outcomes:**
By the end of the Lab, the student
- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

**Exercise 1:**
1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

**Exercise 2:**
1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

**Exercise 3:**
1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

**Exercise 4:**
1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. $1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n$ terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

**Exercise 5:**
1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

**Exercise 6:**
1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

**Exercise 7:**
1. Write a program in C to search an element in a row wise and column wise sorted matrix.

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    2. Write a program in C to print individual characters of string in reverse order.

**Exercise 8:**
1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

**Exercise 9:**
1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

**Exercise 10:**
1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

**Exercise 11:**
1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

**Exercise 12:**
1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

**Exercise 13:**
1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

**Exercise 14:**
1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

**Exercise 15:**
1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

**Exercise 16:**
1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

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| I Year  - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 0 | 0 | 2 | 1 |
| | **ENGINEERING EXPLORATION PROJECT (PR1201)** | | | | |

**Course Objectives:**
- Build mindsets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand their real-world applications
- Use Design Thinking for problem solving methodology for investigating illdefined problems.
- Undergo several design challenges and work towards the final design challenge

Apply Design Thinking on the following Streams to
- Project Stream 1: Electronics, Robotics, IOT and Sensors
- Project Stream 2: Computer Science and IT Applications
- Project Stream 3: Mechanical and Electrical tools
- Project Stream4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

**HOW TO PURSUE THE PROJECT WORK?**
- The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
- The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.
- The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.
- The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.
- Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc
- At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

**TASKS TO BE DONE:**

Task 1: Everyone is a Designer
- Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast
- Gain a quick introduction to the design thinking methodology
- Go through all stages of the methodology through a simple design challenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3: Teams & Problems
- Start Design Challenge  and learn about teams & problems through this

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- Foster team collaboration, find inspiration from the environment and learn how to identify problems

Task 4: Empathizing
- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

Task 5: Ideating
- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

Task 6: Prototyping
- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

Task 7: Testing
- Finish Design Challenge and iterate prototypes and ideas through user feedback
- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit Activity Card

Task 8:
- Final Report Submission and Presentation

**Note:** The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design, Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design Thinking Concept.

**References:**
1) Tom Kelly, *The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm* (Profile Books, 2002)
2) Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (HarperBusiness, 2009)
3) Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good: Innovation in the Social Sector (Columbia Business School Publishing, 2017)

**Other Useful Design Thinking Frameworks and Methodologies:**

- Human-Centered Design Toolkit (IDEO); https://www.ideo.com/post/design-kit
- Design Thinking Boot Camp Bootleg (Stanford D-School); https://dschool.stanford.edu/resources/the-bootcamp-bootleg
- Collective Action Toolkit (frogdesign); https://www.frogdesign.com/wpcontent/ uploads/2016/03/CAT_2.0_English.pdf
- Design Thinking for Educators (IDEO); https://designthinkingforeducators.com/

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| I Year - II Semester | | L | T | P | C |
|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 0 |
| | **CONSTITUTION OF INDIA (MC1204)** | | | | |

**Course Objectives:**
- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

**Course Outcomes**:
At the end of the course, the student will be able to have a clear knowledge on the following:
- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
    1. Know the sources, features and principles of Indian Constitution.
    2. Learn about Union Government, State government and its administration.
    3. Get acquainted with Local administration and Pachayati Raj.
    4. Be aware of basic concepts and developments of Human Rights.
    5. Gain knowledge on roles and functioning of Election Commission

**UNIT I**
Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.
Learning outcomes: After completion of this unit student will
- • Understand the concept of Indian constitution
- • Apply the knowledge on directive principle of state policy
- • Analyze the History, features of Indian constitution
- • Evaluate Preamble Fundamental Rights and Duties

**UNIT II**
Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;
Learning outcomes: After completion of this unit student will
- • Understand the structure of Indian government
- • Differentiate between the state and central government
- • Explain the role of President and Prime Minister
- • Know the Structure of supreme court and High court

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### UNIT III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

### UNIT IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organisation

### UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

### References:

1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
2) SubashKashyap, Indian Constitution, National Book Trust
3) J.A. Siwach, Dynamics of Indian Government & Politics
4) D.C. Gupta, Indian Government and Politics
5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6) J.C. Johari, Indian Government andPolitics Hans
7) J. Raj IndianGovernment and Politics
8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

### e-Resources:

1) nptel.ac.in/courses/109104074/8
2) nptel.ac.in/courses/109104045/
3) nptel.ac.in/courses/101104065/
4) www.hss.iitb.ac.in/en/lecture-details
5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution