

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI  
(AUTONOMOUS)**

**COMPUTER SCIENCE AND ENGINEERING**  
(Effective for the batches admitted in 2019-20)

**I B. Tech – I Semester (Theory – 3, Lab – 4)**

S.No	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P		CIE	SEE	Total
<b>THEORY</b>										
1	BS	19ABS9901	Algebra & Calculus	3	1	0	4	30	70	100
2	BS	19ABS9904	Chemistry	3	0	0	3	30	70	100
3	ES	19AES0501	Problem Solving and Programming	3	1	0	4	30	70	100
<b>PRACTICAL</b>										
4	ES	19AES0301	Engineering Graphics Lab	1	0	4	3	30	70	100
5	LC	19ALC0301	Engineering Workshop	0	0	2	1	30	70	100
6	BS	19ABS9909	Chemistry Lab	0	0	3	1.5	30	70	100
7	ES	19AES0503	Problem Solving and Programming Lab	0	0	4	2	30	70	100
<b>TOTAL</b>							<b>18.5</b>	<b>210</b>	<b>490</b>	<b>700</b>

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**B.Tech I Year I Semester**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19ABS9901</b>	<b>Algebra and Calculus</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**Course Outcomes:**

1. Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
2. Utilize mean value theorems to real life problems.
3. Familiarize with functions of several variables which is useful in optimization.
4. Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
5. Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

**Unit I : Matrix Operations and Solving Systems of Linear Equations**

**12 hrs**

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem,

**Unit II : Quadratic Forms and Mean Value Theorems**

**9 hrs**

Diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);

**Unit III: Multivariable calculus**

**9 hrs**

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

**Unit IV: Multiple Integrals**

**10hrs**

Double integrals, change of order of integration, double integration in polar coordinates, change of Variables in double integration (Cartesian to polar), areas enclosed by plane curves. Evaluation of triple integrals.

**Unit V: Special Functions**

**10 hrs**

Beta and Gamma functions and their properties, relation between beta and gamma functions, Bessel functions, Bessel's equation, Recurrence formulae or  $J_n(x)$ , Generating function- Orthogonality of Bessels functions.

**Textbooks:**

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

**References:**

1. Dr.T.K.V Iyengar, B.Krishna Gandhi, S. Ranganatham and M.V.S.S.N Prasad, Mathematics – 1, S. Chand publications.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
4. N.Bali, M.Goyal, C.Watkins, Advanced Engineering Mathematics, Infinity Science Press.

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO1	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO1:Apply the knowledge of mathematics	1.1	1.1.1
CO3	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO4	PO2 : analyze complex engineering problems	2.1	2.1.3
CO5	Po2 : analyze complex engineering problems	2.1	2.1.3

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**B.Tech I Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19ABS9904	CHEMISTRY	3	0	0	3

**Course Outcomes:**

- Understand the behaviour of, and interactions between matter and energy at both the atomic and molecular levels
- Compare the materials of construction for battery and electrochemical sensors
- Understand the preparation, properties, and applications of thermoplastics & thermo settings, elastomers & conducting polymers.
- HPLC and GC methods used for separation of gaseous and liquid mixtures.
- Understand the disadvantages of using hard water and select suitable treatments domestically and industrially.

**Unit 1: Structure and Bonding Models**

**(10 hrs)**

Planck's quantum theory, Schrodinger wave equation, significance of  $\Psi^1$  and  $\Psi^2$ , applications to hydrogen, particle in a box and their applications for conjugated molecules, crystal field theory – salient features – energy level diagrams for transition metal ions – splitting of orbitals in tetrahedral and octahedral complexes, magnetic properties, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of  $O_2$ ,  $N_2$  and CO, calculation of bond order.

**Unit 2: Electrochemistry and Applications**

**(10 hrs)**

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems, concept of pH, pH meter and applications of pH metry (acid-base titrations), potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, alkali metal sulphide batteries, Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions, button cells,

**Unit 3: Polymer Chemistry**

**(10 hrs)**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylon-66, carbon fibres, Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

**Unit 4: Instrumental Methods and Applications**

**(10 hrs)**

Principle and applications of Colorimetry, AAS, AES, UV-Visible spectrophotometry (Beer-Lambert's law, Instrumentation, Principles and applications of Chromatographic techniques(GC & HPLC), separation of gaseous mixtures and liquid mixtures(GC & HPLC methods).

**Unit 5: Water Technology**

**(10 hrs)**

Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

**Text books:**

- Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
- Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

**Reference books:**

- J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
- Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
- Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011.
- Willard Merritt Dean Settle, 7 th Edition Instrumental methods for analysis

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 2	PO 1: Apply the knowledge of basic science	1.4	1.4.1
CO: 3	PO 1: Apply the knowledge of basic science	1.2	1.2.1
CO: 4	PO 4: Analyze complex engineering problems	2.4	2.4.4
CO: 5	PO 1: Apply the knowledge of Basic science	1.2	1.2.1

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**B.Tech I Year I Semester**

COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0501	Problem Solving and Programming	3	1	0	4

**Course Objectives:**

1. Introduce the internal parts of a computer, and peripherals.
2. Introduce the Concept of Algorithm and use it to solve computational problems
3. Identify the computational and non-computational problems
4. Teach the syntax and semantics of a C Programming language
5. Demonstrate the use of Control structures of C Programming language
6. Illustrate the methodology for solving Computational problems

**Unit 1:**

Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

**Unit 2:**

Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

**Unit 3:**

Types, Operators, and Expressions: Variable names, data types and sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Input and output: standard input and output, formatted output-Printf, formatted input-Scanf.

Control Flow: Statements and blocks, if-else, else-if, switch, Loops-while and for, Loops-Do- while, break and continue, Goto and labels.

Functions and Program Structure: Basics of functions, functions returning non-integers, external variables, scope variables, header variables, register variables, block structure, initialization, recursion, the C processor.

**Unit 4:**

Factoring methods: Finding the square root of a number, the smallest divisor of a number, the greatest common divisor of two integers, generating prime numbers.

Pointers and arrays: Pointers and addresses, pointers and function arguments, pointers and arrays, address arithmetic, character pointers and functions, pointer array; pointers to pointers, Multi-dimensional arrays, initialization of arrays, pointer vs. multi-dimensional arrays, command line arguments, pointers to functions, complicated declarations.

Array Techniques: Array order reversal, finding the maximum number in a set, removal of duplicates from an order array, finding the k<sup>th</sup> smallest element

**Unit 5:**

Sorting and Searching: Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.

Structures: Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, table lookup, typedef, unions, bit-fields.

Some other Features: Variable-length argument lists, formatted input-Scanf, file access, Error handling-stderr and exit, Line Input and Output, Miscellaneous Functions.

**Text Books:**

1. Pradip Dey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2<sup>nd</sup> Edition, Pearson.

**Reference Books:**

1. RS Bichkar "Programming with C", 2012, Universities Press.
2. Pelin Aksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.
3. Byron Gottfried and Jitender Kumar Chhabra, "Programming with C", 4<sup>th</sup> Edition, 2019, McGraw Hill Education.

**Course Outcomes:**

1. Construct his own computer using parts.
2. Recognize the importance of programming language independent constructs
3. Solve computational problems
4. Select the features of C language appropriate for solving a problem
5. Design computer programs for real world problems
6. Organize the data which is more appropriated for solving a problem

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Engineering Knowledge	1.3	1.3.1
CO2	PO2: Problem analysis	2.1	2.1.1
CO3	PO2: Problem analysis	2..2	2.2.2
CO4	PO2: Problem analysis	2.1	2.1.1
CO5	PO2: Problem analysis	2.3	2.3.1
CO6	PO2: Problem analysis	2.2	2.2.3

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0301	Engineering Graphics Lab	1	0	4	3

**Course Outcomes:**

CO: 1	Draw various curves applied in engineering.
CO: 2	Show projections of solids and sections graphically.
CO: 3	Draw the development of surfaces of solids.
CO: 4	Use computers as a drafting tool.
CO: 5	Draw isometric and orthographic drawings using CAD packages.

**Manual Drawing**

**UNIT I**

**Introduction to Engineering graphics:** Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.

- a) Conic sections including the rectangular hyperbola- general method only,
- b) Cycloid, epicycloids and hypocycloid
- c) Involutives

**Projection of points, lines:** Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line.

**UNIT II**

**Projections of Planes:** Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

**Projections of Solids:** Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

**UNIT III**

**Sections of solids:** Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

**Development of surfaces:** Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

**Computer Aided Drafting:**

**UNIT IV**

**Introduction to AutoCAD:** Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions.

Dimensioning principles and conventional representations.

**UNIT V**

**Orthographic Projections:** Systems of projections, conventions and application to orthographic projections.

**Isometric Projections:** Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

**Text Books and Reference Books:**

1. K. L. Narayana & P. Kannaiah, Engineering Drawing, 3/e, Scitech Publishers
2. N. D. Bhatt, Engineering Drawing, 53/e, Charotar Publishers
3. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill
4. Shah and Rana, Engineering Drawing, 2/e, Pearson Education
5. Basant Agrawal & C. M. Agrawal, Engineering Drawing, Tata McGraw-Hill

**Additional Sources**

YouTube: [http://sewor,Carleton.ca/g,kardos/88403/drawings.html](http://sewor.carleton.ca/g/kardos/88403/drawings.html) conic sections-online, red woods.edu

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering knowledge	1.3	1.3.1
CO: 2	PO 3: Design/Development of Solutions	3.2	3.2.1
CO: 3	PO 1: Engineering knowledge	1.3	1.3.1
CO: 4	PO 3: Design/Development of Solutions	3.2	3.2.2
CO: 5	PO 5: Problem analysis	5.1	5.1.1



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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDITS</b>
<b>19ABS9909</b>	<b>CHEMISTRY LAB</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Outcomes:**

- To familiarize the students with the basic concepts of chemistry of materials
- Prepare advanced polymer materials
- Measure the strength of an acid present in secondary batteries
- To familiarize with digital and instrumental methods of analysis

**List of Experiments:**

- Determination of Hardness of a groundwater sample.
- Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method)
- Determination of pH metric titration of strong acid vs. strong base,
- Conductometric titration of strong acid vs. strong base
- Determination of Fe(II) in Mohr's salt by potentiometric method.
- Determination of percentage of Iron in Cement sample by colorimetry
- Determination of Strength of an acid in Pb-Acid battery
- Preparation of phenol-formaldehyde resin
- Preparation of TiO<sub>2</sub>/ZnO nano particles
- Estimation of Calcium in port land Cement
- Adsorption of acetic acid by charcoal
- Thin layer chromatography

<b>List of COs</b>	<b>PO no. and keyword</b>	<b>Competency Indicator</b>	<b>Performance Indicator</b>
CO:1	PO 4: Analysis and interpretation of data	4.3	4.3.3
CO:2	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO:3	PO 4: Analysis and interpretation of data	4.3	4.3.1
CO:4	PO 4: Analysis and interpretation of data	4.3	4.3.2

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COURSE CODE	COURSE TITLE	L	T	P	CREDITS
19AES0503	Problem Solving and Programming Lab	0	0	4	2

**Laboratory Experiments #**

- Assemble and disassemble parts of a Computer
- Design a C program which reverses the number
- Design a C program which finds the second maximum number among the given list of numbers.
- Construct a program which finds the kth smallest number among the given list of numbers.
- Design an algorithm and implement using C language the following exchanges  $a \leftarrow b \leftarrow c \leftarrow d \leftarrow a$
- Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
- Implement the C program which computes the sum of the first n terms of the series  $\text{Sum} = 1 - 3 + 5 - 7 + 9$
- Design a C program which determines the numbers whose factorial values are between 5000 and 32565.
- Design an algorithm and implement using a C program which finds the sum of the infinite series  $1 - x^2/2! + x^4/4! - x^6/6! + \dots$
- Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1.
- Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
- Develop an algorithm which computes the all the factors between 1 and 100 for a given number and implement it using C.
- Construct an algorithm which computes the sum of the factorials of numbers between m and n.
- Design a C program which reverses the elements of the array.
- Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The stars for each number should be printed horizontally.
- Implement the sorting algorithms a. Insertion sort b. Exchange sort c. Selection sort d. Partitioning sort.
- Illustrate the use of auto, static, register and external variables.
- Design algorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.
- Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.
- Design a C program which sorts the strings using array of pointers.

Instructors may add some experiments to the above list. Moreover, 50% of the experiments are to be changed every academic year. Instructors can choose the experiments, provided those experiments are not repetitions.

**Course outcomes:**

- Construct a Computer given its parts (L6)
- Select the right control structure for solving the problem (L6)
- Analyze different sorting algorithms (L4)
- Design solutions for computational problems (L6)
- Develop C programs which utilize the memory efficiently using programming constructs like pointers.

**References:**

- B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", Tata McGraw-Hill, 2<sup>nd</sup> edition, 2002.
- R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO2: Problem analysis	2.1	2.1.1
CO2	PO2: Problem analysis	2.2	2.2.2
CO3	PO2: Problem analysis	2.1	2.1.1
CO4	PO2: Problem analysis	2.3	2.3.1
CO5	PO2: Problem analysis	2.2	2.2.3