BRILLIANT GRAMMAR SCHOOL EDUCATIONAL SOCIETY'S GROUP OF INSTITUTIONS – INTEGRATED CAMPUS HYDERABAD

UGC AUTONOMOUS INSTITUTION

B.Tech. in COMPUTER SCIENCE AND Business Systems

Course Structure & Syllabus (R-25 Regulations)

Applicable from AY 2025-2026 Batch

I Year I Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1.	A1257QMA101BS	Matrices and Calculus	3	1	0	4
2.	A1257QPH102BS	Advanced Engineering Physics	3	0	0	3
3.	A1257QCS103ES	Programming for Problem Solving	3	0	0	3
4.	A1257QEE104ES	Basic Electrical Engineering	3	0	0	3
5.	A1257QME105ES	Engineering Drawing and Computer Aided Drafting	2	0	2	3
6.	A1257QPH106BS	Advanced Engineering Physics Lab	0	0	2	1
7.	A1257QCS107ES	Programming for Problem Solving Lab	0	0	2	1
8.	A1257QEE108ES	Basic Electrical Engineering Lab	0	0	2	1
9.	A1257QCS109ES	Python Programming Lab	0	0	2	1
10.		Induction Program				
		Total Credits	**14**	**1**	**10**	**20**

I Year II Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1.	A1257QMA201BS	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2.	A1257QCH202BS	Engineering Chemistry	3	0	0	3
3.	A1257QCS203ES	Data Structures	3	0	0	3
4.	A1257QEC204ES	Electronic Devices and Circuits	3	0	0	3
5.	A1257QEN205HS	English for Skill Enhancement	3	0	0	3
6.	A1257QCH206BS	Engineering Chemistry Lab	0	0	2	1
7.	A1257QCS207ES	Data Structures Lab	0	0	2	1
8.	A1257QEN208HS	English Language and Communication Skills Lab	0	0	2	1
9.	A1257QME209ES	Engineering Workshop	0	0	2	1
10.	A1257QCS210ES	IT Workshop	0	0	2	1
		Total Credits	**15**	**0**	**10**	**20**

II YEAR I SEMESTER (25 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	A2257QMA301BS	Mathematical and Statistical Foundation	3	0	0	3
2.	A2257Q CB302PC	Computer Organization	3	0	0	3
3.	A2257Q CB303PC	Business Statistics Using R	3	0	0	3
4.	A2257Q CB304PC	Algorithms Design and Analysis	3	0	0	3
5.	A2257Q CB305PC	Database Management Systems	3	0	0	3
6.	A2257Q MA306PC	Computational Mathematics Lab	0	0	2	1
7.	A2257Q CB307PC	Business Statistics Using R Lab	0	0	2	1
8.	A2257Q CB308PC	Algorithms Design and Analysis Lab	0	0	2	1
9.	A2257Q CB309PC	Database Management Systems Lab	0	0	2	1
10.	A2257Q CB310SD	Data Visualization-R Programming/Power BI/ Tableau/Google Chart	0	0	2	1
		Total Credits	**15**	**0**	**10**	**20**

II YEAR II SEMESTER (26 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	A2257QCS401PC	Discrete Mathematics	3	0	0	3
2.	A2257QCS402PC	Operating Systems	3	0	0	3
3.	A2257QCB403PC	Artificial Intelligence	3	0	0	3
4.	A2257QCS404PC	Software Engineering	3	0	0	3
5.	A2257QCB405PC	Computer Networks	3	0	0	3
6.	A2257QMS406HS	Innovation and Entrepreneurship	2	0	0	2
7.	A2257QCS407PC	Operating Systems Lab	0	0	2	1
8.	A2257QCB407PC	Artificial Intelligence Laboratory	0	0	2	1
9.	A2257QCB408PC	Software Engineering Laboratory	0	0	2	1
10.	A2257QCB409SD	Node JS/React JS/Django	0	0	2	1
11.	VA400HS	Indian Knowledge System	1	0	0	1
		Total Credits	**18**	**0**	**08**	**22**

III YEAR I SEMESTER (27 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	A3257QCB501PC	Automata Theory and Compiler Design	3	0	0	3
2.	A3257QCB502PC	Web Technologies	3	0	0	3
3.	A3257QCB503PC	Business Analytics	3	0	0	3
4.		Professional Elective-I	3	0	0	3
5.		Open Elective-1	2	0	0	2
6.	A3257QCB504PC	Compiler Design Laboratory	0	0	2	1
7.	A3257QCB505PC	Web Technologies Laboratory	0	0	2	1
8.	A3257QCB506PC	Business Analytics Laboratory	0	0	2	1
9.	A3257QCB507PC	Field Based Research Project	0	0	4	2
10.	A3257QCB508SD	UI design- Flutter	0	0	2	1
11.	VA500HS/ VA501HS	Gender Sensitization*/ Human Values and Professional Ethics*	1	0	0	0.5+0.5
		Total Credits	**15**	**0**	**12**	**21**

***Note: For the courses Gender Sensitization and Human Values and Professional Ethics** - one hour of instruction will be conducted on alternate weeks. For example, if a one-hour class for Gender Sensitization is conducted this week, then a one-hour class for Human Values and Professional Ethics will be conducted in the following week.

III YEAR II SEMESTER (25 Hours)

S. No	Course Code	Course Title	L	T	P	Credits
1	A3257QCB601PC	Machine Learning	3	0	0	3
2	A3257QCB602PC	Operations Research	3	0	0	3
3	A3257QMS603HS	Business Economics and Financial Analysis	3	0	0	3
4		Professional Elective-II	3	0	0	3
5		Open Elective-II	2	0	0	2
6	A3257QCB604PC	Operations Research Laboratory	0	0	2	1
7	A3257QCB605PC	Linux Programming Laboratory	0	0	2	1
8	A3257QCB606PC	Machine Learning Laboratory	0	0	2	1
9	A3257QEN607HS	English for Employability Skills Lab	0	0	2	1
10	A3257QCB608SD	Big data-Spark	0	0	2	1
11	VA600HS	Environmental Science	1	0	0	1
		Total Credits	**15**	**0**	**10**	**20**

IV YEAR I SEMESTER (25 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	A4257QCB701PC	Deep Learning	3	0	0	3
2.	A4257QCB02PC	Marketing Management and Research	3	0	0	3
3.	A4257QMS703HS	Fundamentals of Management	3	0	0	3
4.		Professional Elective-III	3	0	0	3
5.		Professional Elective-IV	3	0	0	3
6.		Open Elective - III	2	0	0	2
7.	A4257QCB704PC	Deep Learning Laboratory	0	0	2	1
8.	A4257QCB705PC	DevOps Laboratory	0	0	2	1
9.	A4257QCB706PC	Industry Oriented Mini Project/ Internship	0	0	4	2
		Total Credits	**17**	**0**	**08**	**21**

IV YEAR II SEMESTER (48 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.		Professional Elective - V	3	0	0	3
2.		Professional Elective - VI	3	0	0	3
3.	A4257QCB801PC	Project Work	0	0	42	14
		Total Credits	**6**	**0**	**42**	**20**

Professional Electives

	Professional Elective - I	Professional Elective - II	Professional Elective-III	Professional Elective-IV	Professional Elective-V	Professional Elective-VI
1.	Java Programming	Data Science	Image Processing	Recommender Systems	Digital Payment Systems	Robotic Process Automation
2.	Behavioural Economics	Financial Modelling	Business Environment and Ethics	Enterprise Resource Planning	Supply Chain Management	Innovation IP Management and Entrepreneurship
3.	Internet of Things	Digital Marketing	Social Media Analytics	Natural Language Processing	E-Commerce	IT Project Management
4.	Data Warehousing and Data Mining	Business Intelligence	Mobile Application Development	Cloud Computing	Quantum Computing	Green Computing
5.	Mathematical Foundations of Cryptography	Cryptography and Network Security	Cyber Security	Ad Hoc and Sensor Networks	Block chain Technology	Information System Audit & Assurance

OPEN ELECTIVES

Open Elective-I:

1	Digital Marketing
2	Mathematics for Machine Learning

Open Elective-II:

1	Business Analytics
2	Marketing Management and Research

Open Elective-III:

1	IT Project Management
2	Social Media Analytics

MA101BS: MATRICES AND CALCULUS

B.Tech. I Year I Sem.	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

Pre-requisites: Mathematical Knowledge at pre-university level

Objectives: To learn

1. Applying basic operations on matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form
4. Geometrical approach to the mean value theorems and their application to the mathematical problems
5. Finding maxima and minima of functions of two and three variables.
6. Evaluation of multiple integrals and their applications.

Course outcomes: After learning the contents of this paper, the student must be able to

1. Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
2. Find the Eigen values and Eigen vectors
3. Reduce the quadratic form to canonical form using orthogonal transformations.
4. Solve the applications of the mean value theorems.
5. Find the extreme values of functions of two variables with/ without constraints.
6. Evaluate the multiple integrals and apply the concept to find areas, volumes.

UNIT-I: Matrices **8 L**

Rank of a matrix by Echelon form and Normal form – Inverse of Non-singular matrices by Gauss-Jordan method. System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations. Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors **10 L**

Linear Transformation and Orthogonal Transformation: Eigen values – Eigen vectors and their properties – Diagonalization of a matrix – Cayley-Hamilton Theorem (without proof) – Fnding inverse and power of a matrix by Cayley-Hamilton Theorem. Quadratic forms and Nature of the Quadratic Forms – Reduction of Quadratic form to canonical form by Orthogonal Transformation.

UNIT-III: Single Variable Calculus **10 L**

Limit and Continuous of functions and its properties. Mean value theorems: Rolle’s theorem – Lagrange’s Mean value theorem with their Geometrical Interpretation and applications – Cauchy’s Mean value Theorem – Taylor’s Series (All the theorems without proof).
Curve Tracing: Curve tracing in cartesian coordinates.

UNIT-IV: Multivariable Calculus (Partial Differentiation and applications) **10 L**

Definitions of Limit and continuity – Partial Differentiation: Euler’s Theorem – Total derivative – Jacobian – Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration) **10 L**

Evaluation of Double Integrals (Cartesian and polar coordinates) – change of order of integration (only Cartesian form) – Change of variables for double integrals (Cartesian to polar). Evaluation of Triple Integrals – Change of variables for triple integrals (Cartesian to Spherical and Cylindrical polar coordinates). Applications: Areas by double integrals and volumes by triple integrals.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

PH102BS: ADVANCED ENGINEERING PHYSICS

B.Tech. I Year I Sem.

L	T	P	C
3	0	0	3

Pre-requisites: 10+2 Physics

Course Objectives:

1. To study crystal structures, defects, and material characterization techniques like XRD and SEM.
2. To understand fundamental concepts of quantum mechanics and their applications in solids and nanomaterials.
3. To introduce quantum computing principles, quantum gates, and basic quantum algorithms.
4. To learn the properties and applications of magnetic and dielectric materials.
5. To explore the working and applications of lasers and fibre optics in modern technology.

Course Outcomes:

1. **CO1**: Analyze crystal structures, identify defects, and apply XRD and SEM techniques for material characterization.
2. **CO2**: Apply quantum mechanical principles to explain particle behaviour and energy band formation in solids.
3. **CO3**: Understand quantum computing concepts, use quantum gates, and explain basic quantum algorithms.
4. **CO4**: Classify magnetic and dielectric materials and explain their properties, synthesis, and applications.
5. **CO5**: Explain the principles of lasers and fibre optics and their applications in communication and sensing.

UNIT - I: Crystallography & Materials Characterization

Introduction: Unit cell, space lattice, basis, lattice parameters; crystal structures, Bravais lattices, packing factor: SC, BCC, FCC; Miller indices, inter-planar distance; defects in crystals (Qualitative): point defects, line defects, surface defects and volume defects. concept of nanomaterials: surface to volume ratio, X -ray diffraction: Bragg's law, powder method, calculation of average crystallite size using Debye Scherrer's formula, scanning electron microscopy (SEM): block diagram, working principle.

UNIT - II: Quantum Mechanics

Introduction, de-Broglie hypothesis, Heisenberg uncertainty principle, physical significance of wave function, postulates of quantum mechanics: operators in quantum mechanics, eigen values and eigen functions, expectation value; Schrödinger's time independent wave equation, particle in a 1D box, Bloch's theorem (qualitative), Kronig-Penney model (qualitative): E-k diagram, effective mass of electron, formation of energy bands, origin of bandgap, classification of solids, concept of discrete energy levels and quantum confinement in nanomaterials.

UNIT - III: Quantum Computing

Introduction, linear algebra for quantum computation, Dirac's Bra and Ket notation and their properties, Hilbert space, Bloch's sphere, concept of quantum computer, classical bits, Qubits, multiple Qubit system, quantum computing system for information processing, evolution of quantum systems, quantum measurements, entanglement, quantum gates, challenges and advantages of quantum computing over classical computation, quantum algorithms: Deutsch-Jozsa, Shor, Grover.

UNIT - IV: Magnetic and Dielectric Materials

Introduction to magnetic materials, origin of magnetic moment-classification of magnetic materials, hysteresis, Weiss domain theory of ferromagnetism, soft and hard magnetic materials, synthesis of ferrimagnetic materials using sol-gel method, applications: magnetic hyperthermia for cancer treatment, magnets for EV, Giant Magneto Resistance (GMR) device.

Introduction to dielectric materials, types of polarization (qualitative): electronics, ionic & orientation; ferroelectric, piezoelectric, pyroelectric materials and their applications: Ferroelectric Random-Access Memory (Fe-RAM), load cell and fire sensor.

UNIT - V: Laser and Fibre Optics
Introduction to laser, characteristics of laser, Einstein coefficients and their relations, metastable state, population inversion, pumping, lasing action, Ruby laser, He-Ne laser, CO_2 laser, semiconductor diode laser, applications: Bar code scanner, LIDAR for autonomous vehicle.
Introduction to fibre optics, total internal reflection, construction of optical fibre, acceptance angle, numerical aperture, classification of optical fibres, losses in optical fibre, applications: optical fibre for communication system, sensor for structural health monitoring.

TEXT BOOKS:

1. Walter Borchardt-Ott, *Crystallography: An Introduction*, Springer.
2. Charles Kittel, *Introduction to Solid State Physics*, John Wiley & Sons, Inc.
3. Thomas G. Wong, *Introduction to Classical and Quantum Computing*, Rooted Grove

REFERENCE BOOKS:

1. Jozef Gruska, *Quantum Computing*, McGraw Hill
2. Michael A. Nielsen & Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press.
3. John M. Senior, *Optical Fiber Communications Principles and Practice*, Pearson Education Limited.

Useful Links

- https://shijuinpallotti.wordpress.com/wp-content/uploads/2019/07/optical-fiber-communications-principles-and-pr.pdf
- https://www.geokniga.org/bookfiles/geokniga-crystallography_0.pdf
- https://dpbck.ac.in/wp-content/uploads/2022/10/Introduction-to-Solid-State-PhysicsCharles-Kittel.pdf
- https://www.thomaswong.net/introduction-to-classical-and-quantum-computing-1e4p.pdf
- https://www.fi.muni.cz/usr/gruska/qbook1.pdf
- https://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and-quantum-information-nielsen-chuang.pdf

CS103ES: PROGRAMMING FOR PROBLEM SOLVING

B.Tech. I Year I Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives:

- To develop foundational programming skills using C.
- To develop the problem-solving skill using function, pointers.
- To provide fundamental knowledge of arrays and strings.
- To provide foundational knowledge of file handling, data structure and searching.
- To develop the ability to design and analyze recursive functions.

Course Outcomes: The student will learn

- Understand the concept of flow of recursion, stack behavior, searching and sorting
- Student will be able to write, debug, and execute structured C programs.
- Implement functions, and pointers to build effectively in programing.
- Students will be able to design programs using array and strings.
- Able to implement text and binary file operations and linked lists.

UNIT - I: Overview of C:C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Arithmetic Expressions, Formatting Numbers in Program Output.
Selection Structures: Control Structures, Conditions, if Statement, if Statements with Compound Statements, Decision Steps in Algorithms.
Repetition and Loop Statements: Repetition in Programs, Counting Loops and the while Statement, Computing a Sum or Product in a Loop, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement.

UNIT - II: Top-Down Design with Functions: Building Programs from Existing Information, Library Functions, Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments.
Pointers and Modular Programming: Pointers and the Indirection Operator, Functions with Output Parameters, Multiple Calls to a Function with Input/ Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments.

UNIT - III: Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Searching and Sorting an Array, Parallel Arrays and Enumerated Types, Multidimensional Arrays.
Strings: String Basics, String Library Functions: Assignment and Substrings, Longer Strings: Concatenation and Whole-Line Input, String Comparison, Arrays of Pointers.

UNIT - IV: Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical Functions, Recursive Functions with Array and String Parameters
Structure and Union Types: User-Defined Structure Types, Structure Type Data as Input and Output Parameters, Functions with Structured Result Values, Union Types.

UNIT - V: Text and Binary File Pointers: Input/ Output Files - Review and Further Study, Binary Files, Searching a Database.
Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms).

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson.

2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.
7. Byron Gottfried, Schaum’s Outline of Programming with C, McGraw-Hill.

EE104ES: BASIC ELECTRICAL ENGINEERING

B.Tech. I Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites: Mathematics

Course Objectives:

- To understand DC and Single & Three phase AC circuits
- To study and understand the different types of DC, AC machines and Transformers.
- To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.

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

- Understand and analyze basic Electrical circuits
- Study the working principles of Electrical Machines and Transformers
- Introduce components of Low Voltage Electrical Installations.

Course Objectives	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
To understand DC and Single & Three phase AC circuits.	3	2	1		2	0	0	1	2	0	1	2
To study and understand the different types of DC, AC machines and Transformers.	3	2	1	1	3	0	0	0	2	0	1	1
To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.	3	2	0		3	0	0	0	1	2	1	1

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
Understand and analyse basic Electrical circuits	3	2	1	0	1	0	0	0	2	0	2	2
Study the working principles of Electrical Machines and Transformers	3	2	1	0	3	1	0	1	1	2	1	2
Introduce components of Low Voltage Electrical Installations.	3	2	1	1	3	2	0	0	1	0	2	2

UNIT-I:

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II:

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III:

Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV:

Electrical Machines: Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Construction and working. Construction and working of synchronous generator.

UNIT-V:

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, “Basic Electrical Engineering”, S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
6. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
7. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989

ME105ES: ENGINEERING DRAWING AND COMPUTER AIDED DRAFTING

B.Tech. I Year I Sem.	**L**	**T**	**P**	**C**
	2	**0**	**2**	**3**

Course Objectives:

1. To introduce the fundamentals of engineering drawing and projection systems.
2. To develop skills in constructing orthographic, isometric, and sectional views.
3. To train students in interpreting and creating technical drawings using CAD tools.
4. To familiarize students with dimensioning standards and drafting conventions.
5. To bridge manual drafting techniques with computer-aided drafting practices.

Course Outcomes: At the end of the course, the student will be able to:

1. Understand and apply the principles of orthographic and isometric projections.
2. Create sectional views and dimensioned drawings using BIS standards.
3. Use CAD software to generate 2D engineering drawings.
4. Visualize and construct solid models from 2D views.
5. Interpret and produce engineering drawings of mechanical components and assemblies.
6. Demonstrate drafting skills for practical and industrial applications.

UNIT – I: Introduction to Engineering Graphics (Conventional)
Principles of Engineering Graphics and their Significance, Geometrical Constructions, Scales, Plain and Diagonal, Conic Sections including the Rectangular Hyperbola, General method only. Cycloid, Epicycloid and Hypocycloid.

UNIT - II: Orthographic Projections (Conventional and Computer Aided)
Principles of Orthographic Projections, Conventions, Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections, points, lines and planes. Introduction to Computer aided drafting, views, commands and conics.

UNIT – III: Projections of Regular Solids (Conventional and Computer Aided)
Auxiliary Views, Sections or Sectional views of Right Regular Solids, Prism, Cylinder, Pyramid, Cone, Auxiliary views, Computer aided projections of solids, sectional views

UNIT – IV: Development of Surfaces (Conventional): Prism, Cylinder, Pyramid and Cone.

UNIT – V: Isometric Projections (Conventional and Computer Aided)
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. Conversion of orthographic projection into isometric view.

Note:

1. The End Semester Examination will be in conventional mode.
2. CIE – I will be in conventional mode.
3. CIE – II will be using Computer.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhatt, Charotar, 54th Edition, 2023.
2. Engineering Drawing and graphics Using AutoCAD, T. Jeyapoovan and Vikas, S. Chand and company Ltd., 3rd Edition, 2010.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C.M. Agrawal, McGraw Hill, 3rd Edition, 2019.
2. Engineering Graphics and Design, WILEY, John Wiley and Sons Inc, 3rd Edition, 2020.
3. Engineering Drawing, M. B. Shah and B.C. Rane, Pearson, 2nd Edition, 2009.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford, 1st Edition, 2015.
5. Computer Aided Engineering Drawing, K. Balaveera Reddy, CBS Publishers, 2nd Edition, 2015.

PH106BS: ADVANCED ENGINEERING PHYSICS LAB

B.Tech. I Year I Sem.	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Objectives:

1. To provide practical exposure to advanced concepts in solid-state and modern physics.
2. To synthesize and study the physical properties of materials like semiconductors, ferromagnetic, and ferroelectric substances.
3. To perform semiconductor characterization using Hall effect and band gap experiments.
4. To explore the working principles of lasers and optical fibers through hands-on experiments.
5. To develop skills in data analysis, interpretation, and scientific reporting.

Course Outcomes:

1. **CO1:** Synthesize and analyze nanomaterials such as magnetite (Fe_3O_4) using chemical methods.
2. **CO2:** Determine key electrical, magnetic, and optical properties of semiconductors and other functional materials.
3. **CO3:** Characterize semiconductors using Hall effect and energy gap measurement techniques.
4. **CO4:** Demonstrate working knowledge of laser systems and optical fiber parameters through experimental study.
5. **CO5:** Apply scientific methods for accurate data collection, analysis, and technical report writing.

List of Experiments:

1. Synthesis of magnetite (Fe_3O_4) powder using sol-gel method.
2. Determination of energy gap of a semiconductor.
3. Determination of Hall coefficient and carrier concertation of a given semiconductor.
4. Determination of magnetic moment of a bar magnet and horizontal earth magnetic field.
5. Study of B-H curve of a ferro magnetic material.
6. Study of P-E loop of a given ferroelectric crystal.
7. Determination of dielectric constant of a given material.
8. Determination of Curie's temperature of a given ferroelectric material.
9. A) Determination of wavelength of a laser using diffraction grating.
   B) Study of V-I & L-I characteristics of a given laser diode.
10. A) Determination of numerical aperture of a given optical fibre.
    B) Determination of bending losses of a given optical fibre.

Note: Any 8 experiments are to be performed.

CS107ES: PROGRAMMING FOR PROBLEM SOLVING LAB

B.Tech. I Year I Sem.	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

[Note:The programs may be executed using any available Open Source/ Freely available IDE
Some of the Tools available are:
CodeLite: https://codelite.org/
Code::Blocks: http://www.codeblocks.org/
DevCpp : http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:

1. To work with an IDE to create, edit, compile, run and debug programs
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
5. To Write programs using the Dynamic Memory Allocation concept.
6. To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:

1. formulate the algorithms for simple problems
2. translate given algorithms to a working and correct program
3. correct syntax errors as reported by the compilers
4. identify and correct logical errors encountered during execution
5. represent and manipulate data with arrays, strings and structures
6. use pointers of different types
7. create, read and write to and from simple text and binary files
8. modularize the code with functions so that they can be reused

PRACTICE SESSIONS:

Simple numeric problems:

a) Design a program for finding the max and min from the three numbers.
b) Design the program for the simple, compound interest.
c) Design a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

```
5 x 1 = 5
5 x 2 = 10
5 x 3 = 15
```

d) Design a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a) Design a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).
b) Design a program that finds if a given number is a prime number.
c) Design a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
d) 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.

Arrays, Pointers and Functions:

a) Design a C program to find the minimum, maximum and average in an array of integers.
b) Design a C program that uses functions to perform the following:
   I. Addition of Two Matrices
   II. Multiplication of Two Matrices
c) Design a program for reading elements using a pointer into an array and display the values using the array.
d) Design a program for display values reverse order from an array using a pointer.

Files:

a) Design a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
b) 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).

Strings:

a) Design 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) Design a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
c) Design a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
d) Design a C program to count the lines, words and characters in a given text.

Sorting and Searching:

a) Design a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search method.
b) Design a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using binary search method.
c) Design a C program that implements the Bubble sort method to sort a given list of integers in ascending order.
d) Design a C program that sorts the given array of integers using selection sort in descending order
e) Design a C program that sorts the given array of integers using insertion sort in ascending order
f) Design a C program that sorts a given array of names.

Case Study 1: Develop a C program to manage a list of student names and their corresponding grades. The program should allow adding new students, updating grades, searching for a student by name, and displaying all student information.

Case Study 2: Create a C program that calculates the area and perimeter of various geometric shapes (circle, rectangle, triangle). Implement separate functions for each shape's calculation, using pointers to pass structure data containing shape dimensions.

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

EE108ES: BASIC ELECTRICAL ENGINEERING LAB

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

Prerequisites: Basic Electrical Engineering

Course Objectives:

- To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
- To study the transient response of various R, L and C circuits using different excitations.
- To determine the performance of different types of DC, AC machines and Transformers.

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

- Verify the basic Electrical circuits through different experiments.
- Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
- Analyze the transient responses of R, L and C circuits for different input conditions.

Course Objectives	**Program Outcomes**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach	3	2	1		2	0	0	1	2	0	1	2
To study the transient response of various R, L and C circuits using different excitations	3	2	1	1	3	0	0	0	2	0	1	1
To determine the performance of different types of DC, AC machines and Transformers	3	2	0		3	0	0	0	1	2	1	1

Course Outcomes	**Program Outcomes**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
Verify the basic Electrical circuits through different experiments	3	2	1	0	1	0	0	0	2	0	2	2
Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods	3	2	1	0	3	1	0	1	1	2	1	2

Analyse the transient responses of R, L and C circuits for different input conditions	3	2	1	1	3	2	0	0	1	0	2	2

List of experiments/demonstrations:

PART- A (compulsory)

1. Verification of KVL and KCL
2. Verification of Thevenin’s and Norton’s theorem
3. Transient Response of Series RL and RC circuits for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque-Speed Characteristics of a Three-phase Induction Motor.

PART-B (any two experiments from the given list)

1. Verification of Superposition theorem.
2. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
5. No-Load Characteristics of a Three-phase Alternator

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker,”Basic Electrical Engineering”, S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
6. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
7. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

CS109ES: PYTHON PROGRAMMING LAB

B.Tech. I Year II Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

Course Outcomes: After completion of the course, the student should be able to

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Verify programs using modular approach, file I/O, Python standard library
- Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples.

List of Experiments:

1.
   I. Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   II. Start the Python interpreter and type help() to start the online help utility.
1. Start a Python interpreter and use it as a Calculator.
2. Write a program to calculate compound interest when principal, rate and number of periods are given.
3. Read the name, address, email and phone number of a person through the keyboard and print the details.
4. Print the below triangle using for loop.

```
5
4 4
3 3 3
2 2 2 2
1 1 1 1 1
```

5. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character(use 'if-else-if' ladder)
6. Python program to print all prime numbers in a given interval (use break)
7. Write a program to convert a list and tuple into arrays.
8. Write a program to find common values between two arrays.
9. Write a function called palindrome that takes a string argument and returnsTrue if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.
10. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
11. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
12. Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don’t have to be in the same order.
13. The wordlist I provided, words.txt, doesn’t contain single letter words. So you might want to add “I”, “a”, and the empty string.

14. Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
15. Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
16. Remove the given word in all the places in a string?
17. Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
18. Writes a recursive function that generates all binary strings of n-bit length
19. Write a python program that defines a matrix and prints
20. Write a python program to perform multiplication of two square matrices
21. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
22. Use the structure of exception handling all general-purpose exceptions.
23. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
24. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.
25. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.
26. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.
27. Write a python code to read a phone number and email-id from the user and validate it for correctness.
28. Write a Python code to merge two given file contents into a third file.
29. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
30. Write a Python code to Read text from a text file, find the word with most number of occurrences
31. Write a function that reads a file *file1*and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.
32. Import numpy, Plotpy and Scipy and explore their functionalities.
33. Install NumPypackage with pip and explore it.
34. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
35. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

Case Study 1: A Non-Profit Community Organization (NGO) wants to automate its daily activities using a simple Python program. The NGO maintains member information, performs financial calculations, and manages data operations. Currently, everything is done manually, which leads to calculation mistakes and data loss. They need a Python-based command-line tool that can help them manage.

Case Study 2: A modern residential community wants to automate daily utility tasks like bill calculations, personal profile management, pattern-based display outputs for printing, prime number-based smart security system, data conversion, and data validation. The community wants a Python-based utility system that residents can access through a computer terminal.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Introduction to Python Programming, Gowrishakar S, Veena A, CRC Press
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Python for Data Science, Dr. Mohd Abdul Hameed, Wiley publications
6. Core Python Programming, Dr. R. Nageswara Rao, Dreamtech press
7. Introduction to Python, Gowrishankar S, Veena A., CRC Press

MA201BS: ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

B.Tech. I Year II Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn

1. Methods of solving the differential equations of first and higher order.
2. Concept, properties of Laplace transforms.
3. Solving ordinary differential equations using Laplace transforms techniques.
4. The physical quantities involved in engineering field related to vector valued functions
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course outcomes: After learning the contents of this paper, the student must be able to

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real world problems.
3. Use the Laplace Transforms techniques for solving Ordinary Differential Equations.
4. Evaluate the Line, Surface and Volume integrals and converting them from one to another

UNIT-I: First Order Ordinary Differential Equations 8 L

Exact differential equations - Equations reducible to exact differential equations - linear and Bernoulli's equations - Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling – Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order 10 L

Higher order linear differential equations with constant coefficients: Non-Homogeneous terms of the type □^{ax}, sin □□ , cos □□, polynomials in □, □^{ax}□(□) and □ □(□) - Method of variation of parameters.

UNIT-III: Laplace Transforms 10 L

Laplace Transforms: Laplace Transform of standard functions – First shifting theorem – Laplace transforms of functions multiplied by 't' and divided by 't' – Laplace transforms of derivatives and integrals of function – Evaluation of integrals by Laplace transforms – Laplace transform of periodic functions – Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation 10 L

Vector point functions and scalar point functions – Gradient – Divergence and Curl – Directional derivatives - Vector Identities - Scalar potential functions - Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration 10 L

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

CH202BS: ENGINEERING CHEMISTRY

B.Tech. I Year II Sem.	L	T	P	C
	3	0	0	3

Course Objectives:

1. **To develop adaptability to new advances in Engineering Chemistry and acquire the essential skills to become a competent engineering professional.**
2. **To understand the industrial significance of water treatment, fundamental principles of battery chemistry, and the impact of corrosion along with its control methods for structural protection.**
3. **To impart foundational knowledge of various energy sources and their practical applications in engineering.**
4. To equip students with an understanding of smart materials, biosensors, and analytical techniques applicable in engineering, industrial, environmental, and biomedical fields.

Course Outcomes:

1. Students will be able to understand the fundamental properties of water and its applications in both domestic and industrial purposes.
2. Students will gain basic knowledge of electrochemical processes and their relevance to corrosion and its control methods.
3. Students will comprehend the significance and practical applications of batteries and various energy sources, enhancing their potential as future engineers and entrepreneurs.
4. Students will learn the basic concepts and properties of polymers and other engineering materials.
5. Students will be able to apply the principles of UV-Visible, IR spectroscopy and Raman spectroscopy in analyzing pollutants in dye industries and biomedical applications.

UNIT-I: Water and its treatment: [8]

Introduction- Hardness, types, degree of hardness and units. Estimation of hardness of water by complexometric method - Numerical problems. Potable water and its specifications (WHO) - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break- point chlorination. Defluoridation - Nalgonda technique.

Boiler troubles: Scales, Sludges and Caustic embrittlement. Internal treatment of boiler feed water - Calgon conditioning, Phosphate conditioning, Colloidal conditioning. External treatment methods - Softening of water by ion- exchange processes. Desalination of brackish water – Reverse osmosis.

UNIT-II: Electrochemistry and Corrosion: [8]

Introduction- Electrode potential, standard electrode potential, Nernst equation (no derivation), electrochemical cell - Galvanic cell, cell representation, EMF of cell - Numerical problems. Types of electrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE), Secondary reference electrode - Calomel electrode. Construction, working and determination of pH of unknown solution using SHE and Calomel electrode.

Corrosion: Introduction- Definition, causes and effects of corrosion – Theories of corrosion, chemical and electrochemical theories of corrosion, Types of corrosion: galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion - Nature of the metal, Nature of the corroding environment. Corrosion control methods - Cathodic protection Methods - Sacrificial anode and impressed current methods.

UNIT–III: Energy sources: [8]

Batteries: Introduction – Classification of batteries - Primary, secondary and reserve batteries with examples. Construction, working and applications of Zn-air and Lithium ion battery. Fuel Cells – Differences between a battery and a fuel cell, Construction and applications of Direct Methanol Fuel Cell (DMFC).

Fuels: Introduction and characteristics of a good fuel, Calorific value – Units - HCV, LCV- Dulongs formula - Numerical problems.
Fossil fuels: Introduction, Classification, Petroleum - Refining of Crude oil, Cracking - Types of cracking - Moving bed catalytic cracking. LPG and CNG composition and uses.
Synthetic Fuels: Fischer-Tropsch process, Introduction and applications of Hythane and Green Hydrogen.

UNIT - IV: Polymers: [8]

Definition - Classification of polymers: Based on origin and tacticity with examples – Types of polymerization - Addition (free radical addition mechanism) and condensation polymerization.
Plastics, Elastomers and Fibers: Definition and applications (PVC, Buna-S, Nylon-6,6). Differences between themoplastics and thermo setting plastics, Fiber reinforced plastics (FRP).
Conducting polymers: Definition and Classification with examples - Mechanism of conduction in trans-poly-acetylene and applications of conducting polymers.
Biodegradable polymers: Polylactic acid and its applications.

UNIT-V- Advanced Functional Materials: [8]

Smart materials: Introduction, Classification with examples - Shape Memory Alloys – Nitinol, Piezoelectric materials – quartz and their engineering applications.
Biosensor - Definition, Amperometric Glucose monitor sensor.
Interpretative spectroscopic applications of UV-Visible spectroscopy for Analysis of pollutants in dye industry, IR spectroscopy in night vision-security, Pollution Under Control- CO sensor (Passive Infrared detection), Raman spectroscopy (application) - Tumour detection in medical applications.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2. Engineering Chemistry by Rama Devi, Dr. P. Aparna and Rath, Cengage learning, 2025.

REFERENCE BOOKS:

1. Engineering Chemistry: by Thirumala Chary Laxminarayana & Shashikala, Pearson Publications (2020)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi 2011.
3. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi 2015.
4. Engineering Analysis of Smart Material Systems by Donald J. Leo, Wiley, 2007.
5. Challenges and Opportunities in Green Hydrogen by Editors: Paramvir Singh, Avinash Kumar Agarwal, Anupma Thakur, R.K Sinha.
6. Raman Spectroscopy in Human Health and Biomedicine, https://www.worldscientific.com/doi/epdf/10.1142/13094
7. E-Content- https://doi.org/10.1142/13094 | October 2023
8. E-books: https://archive.org/details/EngineeringChemistryByShashiChawla/page/n11/mode/2u

CS203ES: DATA STRUCTURES

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites: A course on “Programming for Problem Solving

Course Objectives

- To provide foundational knowledge of data structures and their operations for efficient data organization, storage, and retrieval in problem solving.
- To introduce advanced tree data structures and their operations for efficient data organization, retrieval, and manipulation.
- To provide students with a strong foundation in advanced data structures.
- To enable students to understand graph theory concepts, graph traversal techniques, anadvanced sorting algorithms along with their applications in computer science.
- To introduce students to hashing techniques, collision resolution strategies, and file organization concepts for efficient data storage and retrieval.

Course Outcomes

- Students will be able to apply linear data structures such as linked lists, stacks, and queues to develop efficient algorithm
- Understand the fundamentals and types of tree data structures.
- Students will be able to understand and implement multi-way search and structures.
- Understand the fundamentals of graphs, including representation and classifications like directed and bi-connected graphs.
- Apply division, multiplication, mid-square, and folding methods to generate hash values.

UNIT – I

Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operation on Data Structures, abstract data types, selecting a Data Structure, Linear list – Introduction, singly linked list, Circular Linked Lists, Doubly Linked List, Stacks- Operations, Stack algorithm, Stack ADT, Stack applications, Queues- operations, Queue Algorithm, Queue ADT, Queue Applications.

UNIT - II

Trees: Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree, Binary Search Trees (BST), BST Operations- Searching, Insertion and Deletion, BST ADT, BST Applications, Threaded Binary Trees, AVL Trees, Red -Black Trees, Splay Trees

UNIT – III

Multi way Search Trees: Introduction, B Trees, B Trees ADT, 2-3 Trees, 2-3- Tree, B* Tree, B+ Trees
Heaps: Binary Heaps, Binomial heaps, Fibonacci heaps, Comparison of Various Heaps, Applications
Searching: Introduction, Interpolation Search, Jump search

UNIT - IV

Graphs: Introduction, Directed Graphs, Bi connected Components, Representation of Graphs, Graph Traversal Algorithms, Graph ADT, Applications of Graphs
Sorting: Radix Sort, Heap sort, Shell Sort, Tree Sort,

UNIT – V

Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method; collisions: Collision Resolution by Open Addressing, Collision Resolution by Chaining
Files and their Organization: Introduction, Data hierarchy, File Attributes, Text and Binary Files, Basic File Operations, File Organization, Indexing

TEXTBOOKS:

1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning
2. Data Structure using C- Reema Thareja, 3rd Edition, Oxford University Press.

REFERENCE:

1. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

EC204ES: ELECTRONIC DEVICES AND CIRCUITS

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	3

Course Overview: This course introduces fundamental semiconductor devices and their behavior, including diodes, BJTs, and FETs. It covers their characteristics, applications, and the analysis of basic electronic circuits. The course also explores rectifiers, voltage regulation, amplifier design, and advanced semiconductor technologies like FinFETs and CNTFETs. Emphasis is placed on developing a strong foundation for analog circuit design and understanding modern device technologies in electronics.

Course Outcomes: By the end of this course, students will be able to:
CO1: Analyze the electrical characteristics and models of semiconductor diodes and apply them in rectifier and clipping circuits.
CO2: Evaluate the operation and configurations of Bipolar Junction Transistors (BJTs) and analyze their input and output characteristics.
CO3: Design appropriate biasing networks for BJTs and determine the operating point for amplifier applications.
CO4: Analyze transistor amplifier circuits using h-parameter models and assess performance for various configurations.
CO5: Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like FinFETs and CNTFETs, and compare modern device technologies.

Course Articulation Matrix

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	1	-	-	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-
CO3	3	3	3	2	1	-	-	-	-	-	-
CO4	3	3	3	2	2	-	-	-	-	-	1
CO5	3	3	2	2	2	1	-	-	-	-	2

Syllabus:

UNIT - I:

Diode Characteristics and Applications: PN junction diode – I-V characteristics, Diode resistance and capacitance, Diode models (Ideal, Simplified, Piecewise Linear), Rectifiers – Half-wave, Full-wave (Center-tap and bridge), Capacitor filter for rectifiers, Clippers and clampers, Zener diode – I-V characteristics and voltage regulation.

UNIT - II:

Bipolar Junction Transistor (BJT): Structure and working principle of BJT, Current components and transistor action, Configurations: Common Base (CB), Common Emitter (CE), Common Collector (CC), Input and output characteristics, Determination of h-parameters from transistor characteristics.

UNIT - III:

BJT Biasing: Need for biasing and stabilization, Load line and operating point, Biasing techniques: Fixed bias, Collector-to-base bias, Voltage divider bias, Stability factors and thermal runaway

UNIT - IV:

Transistor Amplifiers: Transistor as a small-signal amplifier, h-parameter equivalent circuit, CE, CB, CC amplifier analysis using h-parameters, Approximate CE model – with and without emitter bypass capacitor.

UNIT - V:

Special Purpose Diodes: Principle of Operation of – SCR, Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode

Field Effect Transistors and Advanced Devices: JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes – Structure, operation, and characteristics, Advanced Devices: FinFETs - 3D structure, Scaling advantages, CNTFETs - Structure, ballistic transport, fabrication, Comparison: CMOS vs. FinFET vs. CNTFET.

TEXT BOOKS:

1. Millman, Jacob, and Christos C. Halkias. *Electronic Devices and Circuits*. Tata McGraw-Hill, 1991.
2. Boylestad, Robert L., and Louis Nashelsky. *Electronic Devices and Circuit Theory*. Pearson, 11th ed., 2013.
3. Sedra, Adel S., and Kenneth C. Smith. *Microelectronic Circuits*. Oxford University Press, 7th ed., 2014.

REFERENCE BOOKS:

1. Bell, David A. *Electronic Devices and Circuits*. Oxford University Press, 5th ed., 2008.
2. Neamen, Donald A. *Electronic Circuit Analysis and Design*. McGraw-Hill, 2nd ed., 2001.
3. Salivahanan, S., and N. Suresh Kumar. *Electronic Devices and Circuits*. McGraw-Hill Education, 4th ed., 2017.
4. Razavi, Behzad. *Fundamentals of Microelectronics*. Wiley, 2nd ed., 2013.
5. Taur, Yuan, and Tak H. Ning. *Fundamentals of Modern VLSI Devices*. Cambridge University Press, 2nd ed., 2009.

EN205HS: ENGLISH FOR SKILL ENHANCEMENT

B.Tech. I Year II Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

INTRODUCTION

National Education Policy-2020 aims at preparing students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. It also emphasizes language study and promotion of languages through understanding and proper interpretation. English language is central to the educational eco system. The importance of language as medium of communication for personal, social, official and professional needs to be emphasized for clear and concise expression. Teaching and learning of receptive and productive skills viz., Listening, Speaking, Reading and Writing (LSRW) are to be taught and learnt effectively in the undergraduate Engineering programs. Learners should be encouraged to engage in a rigorous process of learning to become proficient users of English language by adopting a deeply focused and yet flexible approach as opposed to rote learning.

In this connection, suitable syllabus, effective pedagogy, continuous assessments and students' involvement result in productive learning. This course supports the latest knowledge and skill requirements and shall meet specified learning outcomes. The main objectives of English language teaching and learning as medium of communication and for promotion of cultural values are embedded in this syllabus. Efforts are being made in providing a holistic approach towards value-based language learning which equips the learner with receptive as well as productive skills.

The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed textbook for detailed study. The students should be encouraged to read the texts leading to reading comprehension. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material.

LEARNING OBJECTIVES: This course will enable the students to:

a. Improve their vocabulary.
b. Use appropriate sentence structures in their oral and written communication.
c. Develop their reading and study skills.
d. Equip students to write paragraphs, essays, précis and draft letters.
e. Acquire skills for Technical report writing.

COURSE OUTCOMES: Students will be able to:

a. Choose appropriate vocabulary in their oral and written communication.
b. Demonstrate their understanding of the rules of functional grammar and sentence structures.
c. Develop comprehension skills from known and unknown passages.
d. Write paragraphs, essays, précis and draft letters.
e. Write abstracts and reports in various contexts.

SYLLABUS: The course content / study material is divided into **Five Units.**

UNIT –I

Theme: **Perspectives**
Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Words Often Misspelt - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Parts of Speech particularly Articles and Prepositions – Degrees of Comparison

Reading: Reading and Its Importance- Sub Skills of Reading – Skimming and Scanning.

Writing: Sentence Structures and Types -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely -Nature and Style of Formal Writing.

UNIT –II

Theme: **Digital Transformation**

Lesson on '*Emerging Technologies*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Reading Strategies-Guessing Meaning from Context – Identifying Main Ideas – Exercises for Practice

Writing: Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence – Linkers and Connectives - Organizing Principles in a Paragraph – Defining- Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence - Essay Writing - Writing Introduction and Conclusion.

UNIT –III

Theme: **Attitude and Gratitude**

Poems on '*Leisure'* by William Henry Davies and '*Be Thankful'* - Unknown Author from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Identifying Topic Sentence and Providing Supporting Ideas - Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Job Application with CV/Resume -Difference between Writing a Letter and an Email - Email Etiquette.

UNIT –IV

Theme: **Entrepreneurship**

Lesson on '*Why a Start-Up Needs to Find its Customers First*' by Pranav Jain from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Standard Abbreviations in English – Inferring Meanings of Words through Context – Phrasal Verbs – Idioms.

Grammar: Redundancies and Clichés in Written Communication – Converting Passive to Active Voice and Vice-Versa.

Reading: Prompt Engineering Techniques- Comprehending and Generating Appropriate Prompts - Exercises for Practice

Writing: Writing Practices- Note Making-Précis Writing.

UNIT –V

Theme: **Integrity and Professionalism**

Lesson on '*Professional Ethics*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Technical Vocabulary and their Usage- One Word Substitutes – Collocations.

Grammar: Direct and Indirect Speech **-** Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) – Inferring the Meaning and Evaluating a Text- Exercises for Practice

Writing: ***Report Writing - Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) - Types of Reports - Writing a Technical Report.***

Note: *Listening and Speaking skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.*

- (**Note**: As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech. First Year is **Open-ended***, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.)

TEXT BOOK:

1. Board of Editors*. 2025. English for the Young in the Digital World.* Orient Black Swan Pvt. Ltd*.*

REFERENCE BOOKS:

1. Swan, Michael. (2016). *Practical English Usage.* Oxford University Press. New Edition.
2. *Karal, Rajeevan. 2023. English Grammar Just for You.* Oxford University Press. New Delhi
3. 2024*. Empowering with Language: Communicative English for Undergraduates.* Cengage Learning India Pvt. Ltd. New Delhi
4. Sanjay Kumar & Pushp Lata. 2022. *Communication Skills – A Workbook.* Oxford University Press. New Delhi
5. Wood,F.T. (2007). *Remedial English Grammar.* Macmillan.
6. Vishwamohan, Aysha. (2013). *English for Technical Communication for Engineering Students.* Mc Graw-Hill Education India Pvt. Ltd.

CH206BS: ENGINEERING CHEMISTRY LAB

B.Tech. I Year II Sem.	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Description: The course includes experiments based on fundamental principles of chemistry essential for engineering students, aiming to develop practical skills and reinforce theoretical concepts.

Course Objectives

1. Students will understand and perform experiments based on core chemical principles relevant to engineering applications.
2. Students will learn to estimate the hardness of water to assess its suitability for drinking purposes.
3. Students will acquire the ability to perform acid-base titrations using instrumental methods such as conductometry, potentiometry, and pH metry.
4. Students will gain hands-on experience in synthesizing polymers like Bakelite and Nylon – 6, 6 in the laboratory.
5. Students will learn to determine the unknown concentration of potassium permanganate (KMnO4) using a calibration curve.

Course Outcomes:

1. Students will develop practical skills through hands-on chemistry experiments relevant to engineering.
2. Students will learn to determine important parameters such as water hardness and the corrosion rate of mild steel under various conditions.
3. Students will be able to apply techniques like conductometry, potentiometry, and pH metry to determine concentrations or equivalence points in acid-base reactions.
4. Students will gain experience in synthesizing polymers such as Bakelite and Nylon-6,6.
5. Students will understand the working principle of colorimetry and the relationship between absorbance and concentration (Beer-Lambert Law).

List of Experiments:

I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.

II. **Conductometry:**
   1. Estimation of the concentration of strong acid by Conductometry.
   2. Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry.

III. **Potentiometry:**
   1. Estimation of concentration of Fe^{+2}ion by Potentiometry using $KMnO_4$.
   2. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone

IV. **pH Metry:** Determination of an acid concentration using pH meter.

V. **Colorimetry:** Verification of Lambert-Beer's law using $KMnO_4$.

VI. **Preparations:**
   1. Preparation of Bakelite.
   2. Preparation Nylon – 6, 6.

VII. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VIII. **Virtual lab experiments:**
   1. Construction of Fuel cell and it's working.
   2. Smart materials for Biomedical applications
   3. Batteries for electrical vehicles.
   4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

CS207ES: DATA STRUCTURES LAB

B.Tech. I Year II Sem.

L	T	P	C
0	0	2	1

Prerequisites: 1. A Course on "Programming for problem solving".

Course Objectives:

1. It covers various concepts of C programming language
2. It introduces searching and sorting algorithms
3. It provides an understanding of data structures such as stacks and queues.

Course Outcomes:

1. Ability to develop C programs for computing and real-life applications using basic elements like control statements, arrays, functions, pointers and strings, and data structures like stacks, queues and linked lists.
2. Ability to Implement searching and sorting algorithms

List of Experiments

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays ii) ADT
5. Write a program that implement Queue (its operations) using
   i) Arrays ii) ADT
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Radix Sort, ii) Heap sort, iii) Shell Sort, iv) Tree Sort
7. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).
8. Write a program to implement
   i) Binary Search tree ii) B Trees iii) B+ Trees iv) AVL trees v) Red - Black trees
9. Write a program to implement the graph traversal methods.
10. Write a program to implement the following Hash Functions: i) Division Method, ii) Multiplication Method, iii) Mid-square Method, iv) Folding Method

Case Study 1: You are building a social media platform and need to represent user connections (friendships) and find the shortest path between two users, or identify users with the most connections.
Case Study 2: Which data structures (stack, queue) would you use to manage print jobs and the "undo" functionality? Describe the operations for adding a print job, processing a job, and implementing the undo feature.

TEXT BOOKS:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

REFERENCE BOOK:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

EN208HS: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

B.Tech. I Year II Sem.	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

The **English Language and Communication Skills (ELCS) Lab** focuses on listening and speaking skills, particularly on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Listening Skills:
Objectives

1. To enable students develop their active listening skills
2. To equip students with necessary training in listening, so that they can comprehend the speech of people from different linguistic backgrounds

Speaking Skills:

3. To improve their pronunciation and neutralize accent
4. To enable students express themselves fluently and appropriately
5. To practise speaking in social and professional contexts

Learning Outcomes: Students will be able to:

1. Listen actively and identify important information in spoken texts
2. Interpret the speech and infer the intention of the speaker
3. Improve their accent for intelligibility
4. Speak fluently with clarity and confidence
5. Use the language in real life situations

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

- **a. Computer Assisted Language Learning (CALL) Lab which focusses on listening skills**
- **b. Interactive Communication Skills (ICS) Lab which focusses on speaking skills**

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise – I
CALL Lab:
Instruction: Speech Sounds-Listening Skill - Importance – Purpose - Types- Barriers- Active Listening
Practice: Listening to Distinguish Speech Sounds (Minimal Pairs) **-** *Testing Exercises*
ICS Lab:

❖ **Diagnostic Test – Activity titled '*Express Your View'***

Instruction: Spoken and Written language - Formal and Informal English - Greetings - Introducing Oneself and Others
Practice: Any Ice-Breaking Activity

Exercise – II
CALL Lab:
Instruction: Listening vs. Hearing - Barriers to Listening
Practice: Listening for General Information - Multiple Choice Questions - *Listening Comprehension Exercises (It is essential to identify a suitable passage with exercises for practice.)*
ICS Lab:
Instruction: Features of Good Conversation – Strategies for Effective Communication
Practice: Role Play Activity - Situational Dialogues -Expressions used in Various Situations -Making Requests and Seeking Permissions – Taking Leave - Telephone Etiquette

Exercise - III
CALL Lab:

Instruction: Errors in Pronunciation – Tips for Neutralizing Mother Tongue Influence (MTI)
Practice: Differences between British and American Pronunciation -*Listening Comprehension Exercises*
ICS Lab:
Instruction: Describing Objects, Situations, Places, People and Events
Practice: Picture Description Activity – Looking at a Picture and Describing Objects, Situations, Places, People and Events *(A wide range of Materials / Handouts are to be made available in the lab.)*

Exercise – IV
CALL Lab:
Instruction: Techniques for *Effective* Listening
Practice: Listening for Specific Details - Listening - Gap Fill Exercises - *Listening Comprehension Exercises*
(It is essential to identify a suitable passage with exercises for practice.)
ICS Lab:
Instruction: How to Tell a Good Story - Story Star- Sequencing-Creativity
Practice: Activity on Telling and Retelling Stories - Collage

Exercise – V
CALL Lab:
Instruction: Identifying the literal and implied meaning
Practice: Listening for Evaluation - Write the Summary – Listening Comprehension Exercises
(It is essential to identify a suitable passage with exercises for practice.)
ICS Lab:
Instruction: Understanding Non-Verbal Communication
Practice: Silent Speech - Dumb Charades Activity

❖ **Post-Assessment Test on 'Express Your View'**

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.
System Requirement (Hardware component):
Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration
ii) High Fidelity Headphones

2. **Interactive Communication Skills (ICS) Lab:**
   The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio & video system and camcorder etc.

✍ **Note: English Language Teachers are requested to prepare Materials / Handouts for each Activity for the Use of those Materials in CALL & ICS Labs.**

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.

- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).

REFERENCE BOOKS:

1. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
2. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient BlackSwan Pvt. Ltd.
3. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press
4. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
5. Ur, Penny and Wright, Andrew. 2022. *Five Minute Activities – A Resource Book for Language Teachers.* Cambridge University Press.

ME209ES: ENGINEERING WORKSHOP

B.Tech. I Year II Sem.

L	T	P	C
0	0	2	1

Prerequisites: Practical skill

Course Objectives:

1. To introduce students to basic manufacturing processes and workshop practices.
2. To provide hands-on training in carpentry, fitting, welding, sheet metal, and machining
3. To develop skills in using hand tools and measuring instruments.
4. To enhance safety awareness and proper handling of workshop equipment.
5. To build a foundational understanding of industrial production and fabrication.

Course Outcomes: At the end of the course, the student will be able to:

1. Understand the basic manufacturing processes and operations.
2. Use hand tools and equipment safely and efficiently.
3. Perform basic operations in carpentry, fitting, welding, sheet metal work, and machining
4. Read and interpret workshop drawings
5. Develop teamwork, time management, and quality awareness in a workshop environment.

1. TRADES FOR EXERCISES: At least two exercises from each trade:

i. **Carpentry:** T- Lap Joint, Dovetail Joint, Mortise and Tenon Joint
ii. **Fitting:** V- Fit, Dovetail Fit and Semi- circular fit
iii. **Tin Smithy**: Square Tin, Rectangular Tray and Conical Funnel
iv. **Foundry**: Preparation of Green Sand Mould using Single Piece and Split Pattern
v. **Welding Practice:** Arc Welding and Gas Welding
vi. **House wiring**: Parallel and Series, Two-way Switch and Tube Light
vii. **Black Smithy**: Round to Square, Fan Hook and S- Hook

2. TRADES FOR DEMONSTRATION AND EXPOSURE: Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXT BOOKS:

1. Workshop Practice, B. L. Juneja, Cengage Learning India, 1st edition, 2015.
2. Workshop Practice Manual, K. Venkata Reddy, BS Publication, 6th Edition, Rpt.2025.

REFERENCE BOOK:

1. Workshop Manual, K. Venugopal, Anuradha Publications, 2012th edition, 2012.

CS210ES: IT WORKSHOP

B.Tech. I Year I Sem.	L	T	P	C
	0	0	2	1

Course Objectives: The IT Workshop for engineers is a training lab course spread over 60 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, PowerPoint and Publisher.

Course Outcomes:

- Perform Hardware troubleshooting
- Understand Hardware components and inter dependencies
- Safeguard computer systems from viruses/worms
- Document/ Presentation preparation
- Perform calculations using spreadsheets

PC Hardware

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: **Orientation & Connectivity Boot Camp:** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: **Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA - Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

PowerPoint

Task 1: Students will be working on basic power point utilities and tools which help them create basic PowerPoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

REFERENCE BOOKS:

1. Comdex Information Technology course tool kit Vikas Gupta, *WILEY Dreamtech*
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, *WILEY Dreamtech*
3. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education.*
4. PC Hardware - A Handbook – Kate J. Chase *PHI* (Microsoft)
5. LaTeX Companion – Leslie Lamport, *PHI/Pearson*.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – *CISCO Press, Pearson Education*.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, *Pearson Education.*

MA301BS: MATHEMATICAL AND STATISTICAL FOUNDATIONS

B.Tech. II Year I Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Pre-requisites: Mathematics courses of first year of study.
Objectives: To learn

1. The Number Theory basic concepts useful for cryptography etc.
2. The theory of Probability, and probability distributions of single random variables.
3. The sampling theory and testing of hypothesis and making inferences.
4. The curve fitting, correlation and regression for the given data.

Course outcomes: After learning the contents of this paper, the student must be able to

1. Apply the number theory concepts to cryptography domain.
2. Apply the concepts of probability and distributions to some case studies.
3. Correlate the material of one unit to the material in other units.
4. Resolve the potential misconceptions and hazards in each topic of study.
5. Fit the curve, correlation and regression for the given data.

UNIT-I: Basics of Number Theory 10 L
Greatest Common Divisors and Prime Factorization: Greatest common divisors – The Euclidean algorithm – The fundamental theorem of arithmetic – Factorization of integers and the Fermat numbers. Congruences: Introduction to congruences – Linear congruences.

UNIT-II: Random Variables and Probability Distributions 8 L
Concept of a Random Variable – Discrete Probability Distributions – Continuous Probability Distributions – Mean of a Random Variable – Variance of a Random Variable
Discrete Probability Distributions: Binomial Distribution – Poisson distribution

UNIT-III: Continuous Distributions and Sampling 10 L
Uniform Distribution – Normal Distribution – Areas under the Normal Curve – Applications of the Normal Distribution – Normal Approximation to the Binomial Distributions. **Fundamental Sampling Distributions:** Random Sampling – Some Important Statistics – Sampling Distributions – Sampling Distribution of Means – Central Limit Theorem.

UNIT-IV: Tests of Hypotheses (Large and Small Samples) 10 L
Statistical Hypotheses: General Concepts – Testing a Statistical Hypothesis. Single sample: Tests concerning a single mean. Two samples: Tests on two mean (Unknown for equal variance). One sample: Test on a single proportion. Two samples: Tests on two proportions. Two- sample tests concerning variances: F-distribution

UNIT-V: Applied Statistics 10 L
Curve fitting by the method of least squares – Fitting of straight lines – Second degree parabolas and more general curves – Correlation and Regression – Rank correlation.

TEXT BOOKS:

1. Kenneth H. Rosen, Elementary Number Theory & its Applications, sixth edition, Addison Wesley, ISBN 978 0-321-50031-1.
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
3. S C Gupta and V K Kapoor, Fundamentals of Mathematical Statistics, Khanna publications.

REFERENCE BOOKS:

1. T.T. Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and statistics for Engineers and scientists, academic press.
3. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

CB302PC: COMPUTER ORGANIZATION

B.Tech. II Year I Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Outcomes:

- Students will be able to analyze and simplify complex logic expressions using Boolean algebra theorems and number base conversions, and then design the corresponding digital circuit using fundamental logic gates.

- Students will be able to apply the K-map method (up to five variables), utilize don't care conditions, and implement the minimized functions efficiently using NAND and NOR gates to produce the simplest two-level circuit realization.

- Students will be able to describe the structural organization of a computer and the representation of fixed and floating-point data, and they will be able to apply RTL notation to define the sequence of arithmetic, logic, and shift micro-operations executed by the CPU's ALSU.

- Students will be able to trace the execution of a machine instruction through the stages of the instruction cycle, interpret the format of instruction codes, and compare and contrast the implementation and advantages of hardwired versus microprogrammed control unit designs.

- Students will be able to compare and contrast the organization of General Register, Accumulator, and Stack CPUs, determine the required instruction and addressing modes for various operations, and trace the steps for fixed-point (addition, subtraction, multiplication) and floating-point arithmetic as executed by the ALU.

Course Objective:

- To introduce students to the principles of digital logic and the mathematical foundation of Boolean Algebra, enabling them to analyze, simplify, and design basic combinational digital circuits.
- To teach students the most effective techniques, particularly the Karnaugh Map method, for minimizing Boolean functions, enabling the design of simpler, more cost-effective digital circuits using standard and universal logic gates.
- To introduce the fundamental architecture of a computer system, detailing the function of its major units and teaching the use of Register Transfer Language (RTL) to symbolically describe the internal data flow and execution of basic micro-operations.
- To detail the instruction execution cycle and the design of a basic computer, focusing on how instructions are structured, how the control unit manages data flow, and how the computer handles essential operations like memory access and I/O interrupts.
- To analyze the internal structure of the Central Processing Unit (CPU), focusing on different register and stack organizations, the principles of various instruction formats and addressing modes, and the detailed implementation of fundamental computer arithmetic algorithms.

UNIT - I

Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.

Boolean Algebra And Logic Gates: Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNIT - II

Gate-Level Minimization: The Map method, Four-variable map, Five-variable map, Product of Sum's simplifications, Don't care conditions, NAND and NOR implementation, other two level implementations, Exclusive-OR Function.

UNIT - III

Basic Structure of Computers: Computer Types, Functional unit, Data Representation, Fixed Point Representation, Floating Point Representation, Error Detection codes.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, Logic micro-operations, Shift micro-operations, Arithmetic logic shift unit.

UNIT - IV

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, Complete Computer Description.

Micro Programmed Control: Control memory, Address sequencing, micro program example, design of control unit, Micro program Sequencer, Hard wired control Vs Micro programmed control

UNIT - V

Central Processing Unit Organization: General Register Organization, STACK organization. Instruction formats, Addressing modes. DATA Transfer and manipulation, Program control. Reduced Instruction set computer.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Floating – point Arithmetic, BCD Adder.

TEXT BOOKS:

1. Digital Design: With an Introduction to the Verilog HDL – Fifth Edition, M. Morris Mano, Pearson

Education.
2. Fundamentals of Logic Design – Roth, 7th Edition, Thomson.
3. Computer Systems Architecture – M. Moris Mano, 3rd Edition, Pearson/PHI
4. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5th Edition, McGraw Hill.

REFERENCE BOOKS:

1. Digital Principles and Design – Donald D. Givone, Tata Mc Graw Hill.
2. Fundamentals of Digital Logic and Micro Computer Design, 5th Edition, M. Rafiquzzaman, Wiley-Interscience.
3. Computer Organization and Architecture – William Stallings 7th Edition, Pearson/ PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 6th Edition PHI/Pearson.

CB303PC: BUSINESS STATISTICS USING R

B.Tech. II Year I Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives: This course equips students with the knowledge and skills:

1. To understand and apply relevance of Probability and Statistical theory to various data analysis situations.
2. To analyse distributions and apply to real-time data.
3. To compare on testing methods to make inference and modelling techniques for decision making.

Course Outcomes: At the end of the course the student should be able to:

1. Understand the basic probability concepts using real time problems.
2. Learn to apply methods and tools related to random variable and distributions.
3. Learn to demonstrate various methods of associations.
4. Make appropriate decisions using statistical inference.
5. Analyse estimation and relate the testing methods to make inference and modelling techniques for decision making.

UNIT-I

Introduction to Probability

Definitions of probability - Axioms of probability - Conditional probability - Multiplication rule - Theorem of total probability – Baye’s theorem - Independence of events.

UNIT-II

Random Variables

Random variable – Discrete and continuous - Probability mass function, and probability density function - Cumulative distribution functions – Bivariate random variable- Joint probability distributions - Marginal and conditional distributions - Mathematical expectation – Variance – Covariance - Moments - Moment generating functions.

UNIT-III

Probability Distributions Sampling **Distributions**

Discrete distributions – Bernoulli - Binomial – Poisson – Geometric; Continuous distributions – Exponential – Gamma - Weibull, Beta, Normal distributions.

Probability and Non-Probability Sampling techniques – Random sampling- Sampling distributions of mean t, f and chi-square test – Central limit theorem.

UNIT-IV

Tests of Statistical Hypotheses

Estimation of Parameters - Statistical hypothesis -Critical region -Large sample tests based on normal distribution for single mean – two means - Single proportion – Two proportion - Tests based on t and F distributions for mean and variance.

UNIT-V

Non-Parametric Tests & Correlation and Regression

Chi-square test - Contingency table, Goodness of fit - Sign test - Rank sum test - Run test - Mann whitney U test - Kruskal wallis test.

Correlation - partial and multiple correlation - Regression – linear and multiple regression.

TEXT BOOK:

1. Richard A Johnson, “Probability and Statistics for Engineers”, 2018, 9th Edition, Pearson Education Ltd, Malaysia.

REFERENCE BOOKS

1. Ronald E Walpole, Raymond H Myers, Sharaon L Myers and Keying Ye, “Probability Statistics for Engineers and Scientists”, 2011, 9th Edition, Prentice Hall, Delhi.
2. Douglas C. Montgomery and George C. Runger, “Applied Statistics and Probability for Engineers”, 2016, 6th Edition, John Wiley & Sons.
3. Robert V. Hogg, J.W. McKean, and Allen T. Craig, “Introduction to Mathematical Statistics”, 2012, 7th Edition, Pearson Education, Asia.
4. Gupta S C and Kapoor V K, “Fundamentals of Mathematical Statistics”,2002,10th Edition, Sultan Chand and Sons.
5. Rohatgi V K and Md. Ehsanes Saleh A K, “An Introduction to Probability and Statistics”, 2001, 2nd Edition, John Wiley & Sons.

CB304PC: ALGORITHMS DESIGN AND ANALYSIS

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Prerequisites: Programming for problem solving and Data Structures

Course Objectives

1. Develop proficiency in evaluating algorithms using asymptotic notations, including best-, average-, and worst-case time/space complexities, and solving related recurrence relations.
2. Master various algorithmic strategies–divide-and-conquer, greedy, dynamic programming, backtracking, and branch-and-bound–identifying suitable use cases and demonstrating their application.
3. Critically assess and contrast different algorithms in terms of efficiency, scalability, and correctness through rigorous analytical reasoning and empirical evaluation.
4. Differentiate between tractable (polynomial-time) and intractable (super-polynomial or exponential-time) problems;
5. **Identify and classify** problems as P, NP, NP-hard, or NP-complete, and **assess** their relationships through polynomial-time reductions and Cook's theorem.

Course Outcomes

1. Able to Apply space and time complexity analysis using asymptotic notations.
2. Able to Design divide-and-conquer algorithms and critically assess their runtime and space trade-offs.
3. Able to Device backtracking and dynamic programming solutions.
4. Able to Apply greedy methods and graph traversal algorithms
5. Able to Analyse and Design branch-and-bound algorithms for NP-hard problems

UNIT - I

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations- Big oh notation, Omega notation, Theta notation, and Little oh notation.

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen's matrix multiplication.

UNIT - II

Disjoint Sets: Disjoint set operations, union and find algorithms, Priority Queue- Heaps, Heapsort

Backtracking: General method, applications, n-queens problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT - III

Dynamic Programming: General method, applications- Optimal binary search tree, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT - IV

Greedy method: General method, applications- Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected components, Biconnected components.

UNIT - V

Branch and Bound: General method, applications - Travelling salesperson problem, 0/1 knapsack problem - LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

TEXT BOOK:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni, and Rajasekaran, University Press.

REFERENCE BOOKS:

1. Design and Analysis of algorithms, Aho, Ullman, and Hopcroft, Pearson education.
2. Introduction to Algorithms, second edition, T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education.
3. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R. Tamassia, John Wiley and Sons.

CB305PC: DATABASE MANAGEMENT SYSTEMS

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites: A course on "Data Structures".

Course Objectives:

- To introduce the fundamentals of database systems, design principles, and conceptual modeling using the ER model.
- To understand the principles of relational databases, including integrity constraints, querying, and relational data modelling.
- To equip students with the knowledge of advanced SQL concepts, database constraints, triggers, and schema refinement techniques for designing efficient and normalized databases.
- Understand the concepts, mechanisms, and protocols for managing transactions, concurrency, and recovery in database systems.
- Understand and apply various file organization and indexing techniques for efficient data storage and retrieval.

Course Outcomes:

- Students will be able to design and model databases conceptually and understand DBMS structure and data abstraction.
- Apply relational algebra, relational calculus, and SQL concepts to design, query, and manage relational databases effectively.
- Students will be able to write complex SQL queries, enforce data integrity using constraints and triggers, and design well-normalized database schemas up to 5NF.
- Apply transaction management techniques to ensure atomicity, consistency, isolation, durability, and recoverability in database systems.
- Ability to design, implement, and compare different indexing structures like hash-based, tree-based, and B+ trees for optimized data access.

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views.

Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multivalued dependencies, FOURTH normal form, FIFTH normal form.

UNIT - IV

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions.

UNIT - V

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

MA306PC: COMPUTATIONAL MATHEMATICS LAB
(Using Python/MATLAB software)

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Matrices, Iterative methods and ordinary differential equations

Course Objectives: To learn

1. Solve problems of Eigen values and Eigen Vectors using Python/MATLAB.
2. Solution of Algebraic and Transcendental Equations using Python/MATLAB
3. Solve problems of Linear system of equations
4. Solve problems of **First-Order ODEs Higher order linear differential equations with** constant coefficients

Course outcomes: After learning the contents of this paper, the student must be able to

1. Develop the code to find the Eigen values and Eigen Vectors using Python/MATLAB.
2. Develop the code find solution of Algebraic and Transcendental Equations and Linear system of equations using Python/MATLAB
3. Write the code to solve problems of **First-Order ODEs Higher order linear differential equations with** constant coefficients

*** Visualize all solutions Graphically through programmes**

UNIT - I: Eigen values and Eigenvectors: **6P**

Programs:

- Finding real and complex Eigen values.
- Finding Eigen vectors.

UNIT-II: Solution of Algebraic and Transcendental Equations **6P**

Bisection method, Newton Raphson Method

Programs:

- Root of a given equation using Bisection method.
- Root of a given equation Newton Raphson Method.

UNIT-III: Linear system of equations: **6P**

Jacobi's iteration method and Gauss-Seidal iteration method

Programs:

- Solution of given system of linear equations using Jacobi's method
- Solution of given system of linear equations using Gauss-Seidal method

UNIT-IV: First-Order ODEs **8P**

Exact and non-exact equations, Applications: exponential growth/decay, Newton's law of cooling.

Programs:

- Solving exact and non-exact equations
- Solving exponential growth/decay and Newton's law of cooling problems

UNIT-V: Higher order linear differential equations with constant coefficients **6P**

Programs:

- Solving homogeneous ODEs
- Solving non-homogeneous ODEs

TEXT BOOKS:

1. MATLAB and its Applications in Engineering, Rajkumar Basal, Ashok Kumar Geo, Manoj Kumar Sharma, Pearson publication.
2. Kenneth A. Lambert, The fundamentals of Python: First Programs, 2011, Cengage Learnings.
3. Think Python First Edition, by Allen B. Downey, Orielly publishing.
4. Introduction to Python Programming, William Mitchell, Povel Solin, Martin Novak et al., NCLab Public Computing, 2012.
5. Introduction to Python Programming, ©Jacob Fredslund, 2007.

REFERENCE BOOKS:

1. An Introduction to Python, John C. Lusth, The University of Alabama, 2011.
2. Introduction to Python, ©Dave Kuhlman, 2008.

CB307PC: BUSINESS STATISTICS USING R LAB

B.Tech. II Year I Sem.	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Objectives: This course equips students with the knowledge and skills:

- To enable the students for having experimental knowledge of basic concepts of statistics using R programming.
- To study the relationship of real-time data and decision making through testing methods using R.
- To make the students capable to do experimental research using statistics in various engineering problems.

Course Outcomes: At the end of the course the student should be able to:

- Demonstrate R programming for statistical data.
- Carry out appropriate analysis of statistical methods through experimental techniques using R.

List of Experiments

1. Introduction to R software and packages.
2. Understanding data types; importing/exporting data.
3. Plotting and visualizing data using graphical representations.
4. Fitting the following probability distributions: binomial distribution, poisson distribution, exponential distribution, gamma distribution, weibull distribution, normal distribution.
5. Testing of hypothesis for one sample mean and proportion from real-time problems.
6. Testing of hypothesis for two sample means and proportion from real-time problems.
7. Applying the t test for independent and dependent samples.
8. Applying chi-square test for goodness of fit and contingency test to real dataset.
9. Correlation, partial and multiple correlations.
10. Simple linear regression model and multiple linear regression to real dataset.

TEXT BOOK:

1. Christian Heumann, Michael Schomaker and Shalabh, “Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R” 2016, Springer.

REFERENCE BOOKS:

1. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, “An Introduction to Statistical Learning with Applications in R”, 2023, 2nd Edition, Springer.
2. Joseph Schmuller, “Statistical analysis with R”, 2017, John wiley and sons Inc., New Jersey.

CB308PC: ALGORITHMS DESIGN AND ANALYSIS LAB

B.Tech. II Year I Sem.	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Outcomes

CO1 – Sorting & Complexity Analysis
Students will be able to implement and analyze selection, insertion, and quick sort algorithms–measuring comparisons, swaps, and runtime across varying inputs–to determine empirical time complexity and performance trends.

CO2 – Recursion & Algorithmic Implementation
Students will be able to develop and compare recursive and iterative solutions for factorial and GCD, tracking and contrasting call-stack depth and step counts for correctness and efficiency.

CO3 – String & Sequence Algorithms
Students will be able to compute edit distance using dynamic programming and resolve longest common subsequence and increasing subsequence problems, demonstrating proficiency in sequence alignment problems.

CO4 – Dynamic & Greedy Methodologies
Students will be able to implement and compare dynamic programming (0/1 knapsack, matrix chain multiplication, Floyd-Warshall) and greedy (fractional knapsack, Huffman encoding) approaches to solve optimization tasks effectively.

CO5 – Graph Algorithms & Traversals
Students will be able to apply DFS to test graph connectivity, and implement Prim's MST and Floyd-Warshall APSP; they will analyze time/space requirements and algorithm suitability under differing graph conditions.

CO6 – Backtracking Solutions
Students will be able to solve n-Queens and graph coloring problems using backtracking, counting recursive calls, and exploring solution spaces to evaluate search effort and correctness.

CO7 – Branch-and-Bound Strategies
Students will be able to implement branch-and-bound solutions for 0/1 knapsack (LC) and Traveling Salesman Problem, plotting runtime growth across input sizes to compare exact vs exponential-time behaviors.

Laboratory Experiments

1. **Selection Sort Analysis**
   Implement Selection Sort for 10 elements and calculate the total number of operations (comparisons and swaps).
2. **Factorial Computation**
   Write both iterative and recursive versions to compute n!; compare their runtimes and call-stack depths.
3. **Insertion Sort Evaluation**
   Implement Insertion Sort and empirically analyze its time complexity across best, average, and worst cases.
4. **Edit Distance (Levenshtein Distance)**
   Given two strings, compute the minimum number of insertions, deletions, or substitutions needed to convert one into the other.

5. **GCD via Recursion**
   Use the Euclidean algorithm recursively to find the Greatest Common Divisor and count the number of recursive steps.
6. **Quick Sort Performance Study**
   Implement Quick Sort, record execution time for various input sizes (generated or from files), and plot time vs. n.
7. **Graph Connectivity Check**
   Use Depth-First Search to determine whether a given graph is connected.
8. **Huffman Encoding**
   Apply the greedy strategy to generate a Huffman tree and compress input data.
9. **Fractional Knapsack Problem**
   Implement the greedy fractional-knapsack algorithm and validate correctness and runtime.
10. **Prim's MST Implementation**
    Construct the Minimum Spanning Tree using Prim's algorithm and analyze its time complexity.
11. **0/1 Knapsack via Dynamic Programming**
    Develop a DP solution for 0/1 Knapsack and compare its efficiency against greedy or other approaches.
12. **Longest Common Subsequence (LCS)**
    Solve the LCS problem using dynamic programming to find the maximum-length subsequence common to two strings.
13. **Longest Increasing Subsequence (LIS)**
    Determine the length of the longest strictly increasing subsequence in a sequence of integers.
14. **All-Pairs Shortest Paths (Floyd–Warshall)**
    Use the Floyd-Warshall algorithm on directed graphs to compute shortest path distances between all node pairs.
15. **Matrix Chain Multiplication**
    Apply dynamic programming to find the optimal parenthesization of matrix multiplications for minimum cost.
16. **Subset Sum Problem**
    Given a set of positive integers and a target sum d, find a subset whose sum equals d (or report none exists).
17. **N-Queens via Backtracking**
    Implement the N-Queens solution finder using backtracking and report all possible placements.
18. **Graph Coloring via Backtracking**
    Determine if a graph can be colored with k colors using backtracking and output valid color assignments.
19. **Branch-and-Bound 0/1 Knapsack**
    Implement the least-cost branch-and-bound method for 0/1 Knapsack and report performance metrics like nodes explored.
20. **Travelling Salesman (Branch-and-Bound)**
    Solve the TSP using branch-and-bound for graph sizes n = 4, 8, 12, 16, 20. Record execution time vs. n, plot results, and analyze growth (polynomial vs. exponential).

Case Study 1 (Sorting):

A school used Insertion Sort and Selection Sort to arrange student marks and found that Insertion Sort worked faster on nearly sorted data. Selection Sort took the same time for all cases due to its fixed comparison count.

Case Study 2 (0/1 Knapsack):

A delivery company used the Dynamic Programming-based 0/1 Knapsack to choose the most valuable items that fit a truck's weight limit. The DP method outperformed the greedy approach by finding the truly optimal combination.

CB309PC: DATABASE MANAGEMENT SYSTEMS LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

Course Outcomes:

- Design database schema for a given application and apply normalization
- Acquire skills in using SQL commands for data definition and data manipulation.
- Develop solutions for database applications using procedures, cursors and triggers

List of Experiments:

1. Concept design with E-R Model
2. Relational Model
3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. A) Querying (using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.) B) Nested, Correlated subqueries
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursors

Case study 1: In the modern world, online bookstores have become popular for buying and selling books. Managing an online bookstore manually is inefficient due to the high volume of books, orders, customers, and payments. To handle this efficiently, a Database Management System (DBMS) is implemented to store, retrieve, and manage data securely and reliably. This case study demonstrates how DBMS concepts like tables, relationships, queries, transactions, and normalization are applied in a real-time online bookstore scenario.

Case Study 2: A college wants to develop an online Student Attendance and Performance Management System where faculty and administrators can:

1. Maintain student records (personal details, contact info, enrollment info).
2. Record daily attendance for each student.
3. Store exam marks and grades.
4. Generate reports like attendance percentage, top-performing students, or students at risk.

Currently, these processes are manual, prone to errors, and time-consuming

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill,3rd Edition
2. Database System Concepts, Silberschatz, Korth, McGraw Hill, V edition.

REFERENCES BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

CB310SD: DATA VISUALIZATION - R PROGRAMMING/ POWER BI/TABLEAU/GOOGLE CHART

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives:

1. Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
2. To discern patterns and relationships in the data.
3. To build Dashboard applications.
4. To communicate the results clearly and concisely.
5. To be able to work with different formats of data sets.

Course Outcomes:

1. Understand how to import data into Tableau.
2. Understand concepts of Dimensions and Measures.
3. Develop Programs and understand how to map Visual Layouts and Graphical Properties
4. Create Dashboard, custom charts, and, publish to tableau online for any real time dataset

List of Programs

1. Understanding Data, what is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization.
2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, creating basic charts (line, bar charts, Tree maps), Using the Show me panel.
3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculations and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data
6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colors.
8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.
9. Tableau file types, publishing to Tableau Online, sharing your visualizations, printing, and exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.
11. Visualize various data patterns taking any dataset from Kaggle.
12. Visualize data patterns using Google Charts by creating interactive Line, Bar, and Pie charts along with Dashboards using HTML and JavaScript.

Case Study 1: A retail chain wants to analyze its sales performance, customer behavior, and product trends to improve decision-making. The management requires visual insights from sales and customer datasets to identify: 1) Top-selling products, 2) Monthly/seasonal sales trends, 3) Customer purchase patterns, 4) Sales performance by region/store 5) Stock optimization opportunities. You are tasked to analyze and visualize the data using R Programming or Power BI to provide actionable insights.

Case Study 2: A retail company, ShopSmart, operates multiple stores across the country and sells a variety of products. The management wants to analyze and visualize sales performance to make informed decisions. They need a dashboard that provides insights into:

1) Monthly and yearly sales trends, 2) Product-wise revenue contribution, 3) Store-wise performance, 4) Top-performing and underperforming products and 6) Customer purchasing behavior.

REFERENCE BOOKS:

1. Brett Powell, Microsoft Power BI cookbook, 2nd edition.
2. Roger D. Peng, R Programming for Data Science
3. Norman Matloff Cengage Learning India, The Art of R Programming.

WEB RESOURCE:

1. https://developers.google.com/chart/interactive/docs.

CS401PC: DISCRETE MATHEMATICS

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives:

1. Introduces elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

Course Outcomes:

1. Understand and construct precise mathematical proofs
2. Apply logic and set theory to formulate precise statements
3. Analyze and solve counting problems on finite and discrete structures
4. Describe and manipulate sequences
5. Apply graph theory in solving computing problems

UNIT - I

Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT - II

Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

UNIT - III

Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

UNIT - IV

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

UNIT - V

Graph Theory: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCE BOOKS:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph. P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill Publishing co.

CS402PC: OPERATING SYSTEMS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites:

1. A course on “Computer Programming and Data Structures”.
2. A course on “Computer Organization and Architecture”.

Course Objectives:

- Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection)
- Introduce the issues to be considered in the design and development of operating system
- Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix
- To understand memory management concepts and techniques for efficient utilization of main memory and virtual memory.
- To understand file system concepts, structures, and operations for efficient data management and access.

Course Outcomes:

- Will be able to control access to a computer and the files that may be shared
- Demonstrate the knowledge of the components of computers and their respective roles in computing.
- Ability to recognize and resolve user problems with standard operating environments.
- Gain practical knowledge of how programming languages, operating systems, and architectures interact and how to use each effectively.
- Students will be able to apply file system operations and system calls to manage files effectively in operating systems.

UNIT - I

Operating System - Introduction, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls

Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT - II

CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

UNIT - III

Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors

Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT - IV

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT - V

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCE BOOKS:

1. Operating Systems- Internals and Design Principles, William Stallings, Fifth Edition–2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S. Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/ Pearson Education
5. UNIX Internals -The New Frontiers, U. Vahalia, Pearson Education.

CB403PC: ARTIFICIAL INTELLIGENCE

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Prerequisites:

1. Programming for problem solving, Data Structures.

Course Objectives:

- To understand and apply fundamental AI search techniques for designing intelligent, problem-solving agents.
- To develop the ability to model and solve complex problems using adversarial search, constraint satisfaction, and propositional logic-based reasoning.
- To understand and apply First-Order Logic for representing knowledge and performing logical inference in intelligent systems.
- To understand how knowledge is represented through ontologies and categories, and how classical planning algorithms are used to generate intelligent action sequences.
- To introduce probabilistic models and reasoning techniques for handling uncertainty in intelligent systems.

Course Outcomes:

- Students will be able to implement and compare various uninformed and informed search strategies to solve real-world AI problems.
- Students will be able to design intelligent agents that perform logical inference, handle constraints, and make optimal decisions in competitive or uncertain environments.
- Students will be able to model real-world knowledge using FOL and implement inference techniques such as unification, chaining, and resolution.
- Students will be able to build structured knowledge models and apply classical planning methods to solve real-world decision-making problems.
- Students will be able to apply Bayesian networks and other probabilistic methods to make informed decisions under uncertainty.

UNIT - I

Introduction to AI: Intelligent Agents, problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, informed (Heuristic) Search **Strategies**: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces

UNIT - II

Problem Solving by Search-II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions. Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT - III

Logic and Knowledge Representation

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT - IV

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

UNIT - V

Uncertain knowledge and Learning Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in

Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

TEXT BOOK:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edition, E. Rich and K. Knight (TMH).
2. Artificial Intelligence, 3rd Edition., Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

CS404PC: SOFTWARE ENGINEERING

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives

- To understand the fundamental concepts, processes, and models of software engineering for developing high-quality software systems.
- To equip students with the knowledge and skills to gather, analyze, validate, and manage software requirements effectively.
- To equip students with the principles and techniques of software design, modeling, and architectural development using UML.
- To equip students with strategic approaches for software testing, debugging, and quality measurement.
- To provide students with an understanding of risk and quality management principles in software development.

Course Outcomes

- Students will be able to apply software engineering principles and process models to plan, design, and manage effective software development projects.
- Students will be able to produce clear, complete, and feasible software requirements and specifications for real-world systems.
- Students will be able to create and analyze software architectures, design models, and UML diagrams for real-world systems.
- Students will be able to design, execute, and evaluate software tests while measuring and ensuring software quality.
- Students will be able to identify, analyze, and manage software risks while ensuring software quality using standard practices and tools.

UNIT - I

Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths. A Generic view of process: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). Process models: The waterfall model, Spiral model, Incremental Process Models, Concurrent Models, Component based development and Agile Development.

UNIT - II

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT - III

Design Engineering: Design process and design quality, design concepts, the design model.

Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, use case diagrams, class diagrams, sequence diagrams, collaboration diagrams, activity diagrams and component diagrams.

UNIT - IV

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT - V

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM. Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

TEXT BOOKS:

1. Software Engineering, A practitioner’s Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.

2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.
4. Fundamentals of Software Engineering-Rajib Mall, PHI.

CB405PC: COMPUTER NETWORKS

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Prerequisites

1. A course on "Programming for problem solving".
2. A course on "Data Structures".

Course Objectives

- To provide a comprehensive understanding of computer networks, Internet architecture, protocols, and network security concepts.
- To provide a comprehensive understanding of network application principles, architectures, protocols, and socket programming.
- To provide a comprehensive understanding of transport-layer protocols and mechanisms ensuring reliable, efficient, and congestion-controlled data communication over networks.
- To understand the principles, mechanisms, and algorithms of IP forwarding, addressing, and routing in computer networks.
- Understand and apply link-layer concepts, protocols, and error-handling techniques in wired and wireless networks.

Course Outcomes

- Students will be able to analyze, design, and evaluate network architectures, protocols, and security mechanisms effectively.
- Ability to design, implement, and analyze network applications using various application-layer protocols and socket programming.
- Students will be able to analyze, design, and evaluate transport-layer protocols like UDP and TCP with reliable data transfer, flow control, and congestion control mechanisms.
- Students will be able to analyze, design, and implement IP-based forwarding and routing strategies, including unicast, broadcast, and multicast, using protocols like RIP, OSPF, and BGP.
- Ability to design, analyze, and implement reliable link-layer and LAN/WLAN communication systems.

UNIT - I

Introduction: The Internet, Protocol, Network Edge, Access Networks, Network Core, Packet Switching, Circuit Switching, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol reference models: ISO-OSI, TCP/IP, Types of Network attacks, History of Computer Networking and the Internet.

UNIT-II

Application Layer: Principles of Network Applications, Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, SMTP, DNS, Peer-to-Peer Applications, Socket Programming: Creating Network Applications.

UNIT - III

Transport Layer: Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N (GBN), Selective Repeat (SR), Connection-Oriented Transport: TCP, The TCP Connection, Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control, TCP Congestion Control, Fairness.

UNIT - IV

Network Layer: Data and Control plane, Forwarding and Routing 308, Network Service Models, Virtual Circuit and Datagram Networks, Router working, The Internet Protocol (IP): Forwarding and Addressing in the Internet, Datagram Format, IPv4 Addressing, Internet Control Message Protocol (ICMP), IPv6, IP Security, Routing Algorithms- The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet-Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter-AS Routing: BGP, Broadcast and Multicast Routing, Broadcast Routing Algorithms, Multicasting.

UNIT - V

The Link Layer: The Services Provided by the Link Layer, Error-Detection and -Correction Techniques-Parity Checks, Checksum Methods, Cyclic Redundancy Check (CRC), Hamming code, Multiple Access Links and Protocols, Channel Partitioning Protocols, Random Access Protocols, Taking-Turns Protocols, DOCSIS: The Link-Layer Protocol for Cable Internet Access, Switched Local Area Networks, Link-Layer Addressing and ARP, Ethernet, Link-Layer Switches, Virtual Local Area Networks (VLANs), Link Virtualization-Multiprotocol Label Switching (MPLS), Data Center Networking, A Day in the Life of a Web Page Request. Wireless network characteristics, Wireless LAN.

TEXT BOOKS:

1. Computer Networking: A Top-Down Approach – James F.Kurose, Keith W. Ross, Pearson
2. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson/PHI

REFERENCE BOOK:

1. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

MS406HS: INNOVATION AND ENTREPRENEURSHIP

B.Tech. II Year II Sem.

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2	0	0	2

Course Objectives:

1. To familiarize on the basic concepts of innovation, entrepreneurship and its importance.
2. To Identify and analyze the process of problem-opportunity identification, market segmentation, and idea generation techniques.
3. To initiate prototype development and understand minimum viable product.
4. To develop initial Business and financial planning and Go-to-Market strategies
5. To impart knowledge on establishing startups, venture pitching and IPR

Course Outcomes:

1. Understand the entrepreneurship and the entrepreneurial process and its significance in economic development.
2. Assess the problem from an industry perspective and generate solutions using the design thinking principles.
3. Assess market competition, estimate market size, and develop a prototype.
4. Analyze Business and financial planning models and Go-to-Market strategies.
5. Able to build a start-up, register IP and identify funding opportunities.

Unit I: Fundamentals of Innovation and Entrepreneurship

Innovation: Introduction, need for innovation, Features, Types of innovations, innovations in manufacturing and service sectors, fostering a culture of innovation, planning for innovation.
Entrepreneurship: Introduction, types of entrepreneurship attributes, mindset of entrepreneurial and intrapreneurial leadership, Role of entrepreneurs in economic development. Woman Entrepreneurship, Importance of on-campus startups. Understanding to build entrepreneurial mindset, attributes and networks individuals while on campus.
Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity.

Unit II: Problem and Customer Identification

Identification of gap, problem, analyzing the problem from a industry perspective, real-world problems**,** market and customer segmentation, validation of customer problem fit, Iterating problem-customer fit, Competition and Industry trends mapping and assessing initial opportunity, Porter's Five Force Model. Idea generation, Ideation techniques: Brainstorming, Brain writing, Round robin, and SCAMPER, Design thinking principles, Mapping of solution to problem.
Core Teaching Tool: Several types of activities including: Class, game, Gen AI, 'Get out of the Building' and Venture Activity.

Unit III: Opportunity assessment and Prototype development

Identify and map global competitors, review industry trends, and understand market sizing: TAM, SAM, and SOM. Assessing scope and potential scale for the opportunity.
Understanding prototyping and Minimum Viable Product (MVP). Developing a prototype: Testing, and validation.
Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

Unit IV: Business & Financial Models

Introduction to Business Model and types, Lean Canvas Approach: 9-block lean canvas model, building lean canvas for your startup. Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning: Types of costs, preparing a financial plan for profitability using a financial template, understanding the basics of Unit economics, Economies of Scale and analyzing financial performance. Go-To-Market (GTM) approach – Selecting the Right Channel,

creating digital presence, and building customer acquisition strategy.
Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

Unit V: Startups and IPR

Startup requirements, building founding team members and mentors, pitch preparation, start-up registration process, funding opportunities and schemes, institutional support to entrepreneurs, startup lifecycle, documentation, legal aspects in startup, venture pitching readiness, National Innovation Startup Policy (NISP) and its features.

Patents, Designs, Patentability, Procedure for grants of patents. Indian Scenario of Patenting, International Scenario: International cooperation on Intellectual Property. Patent Rights: Scope of Patent Rights. Copyright, trademark, and GI. Licensing and transfer of technology.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

Suggested Readings:

1. John R Bessant, Joe Tidd, Innovation and Entrepreneurship, 4E, Wiley, Latest Edition.
2. Ajay Batra, The Stratup Launch Book- A Practical Guide for Launching Customer Centric Ventures, Wiley, 2020. (For Core Teaching Tool).
3. Entrepreneurship Development and Small Business Enterprises, Poornima M Charantimath, 3E, Pearson, 2018.
4. D.F. Kuratko and T.V. Rao, Entrepreneurship: A South-Asian Perspective, Cengage Learning, 2013.
5. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
6. NISP -Brochure inside pages - startup_policy_2019.pdf

CS407PC: OPERATING SYSTEMS LAB

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

Prerequisites:

- A course on “Programming for Problem Solving”.
- A course on “Computer Organization and Architecture”.

Co-requisite: A course on “Operating Systems”.

Course Objectives:

1. To provide an understanding of the design aspects of operating system concepts through simulation.
2. Introduce basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix.

Course Outcomes:

1. Simulate and implement operating system concepts such as scheduling, deadlock management, file management and memory management.
2. Able to implement C programs using Unix system calls.

List of Experiments:

1. Write C programs to simulate the following CPU Scheduling algorithms a) FCFS b) SJF c) Round Robin d) priority
2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, lseek, stat, fork, exit)
3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
4. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.
5. Write C programs to illustrate the following IPC mechanisms a) Pipes b) FIFOs c) Message Queues d) Shared Memory
6. Write C programs to simulate the following memory management techniques a) Paging b) Segmentation
7. Write C programs to simulate Page replacement policies a) FCFS b) LRU c) Optimal

Case Study 1: A large hospital wants to implement a Patient Management System (PMS) that handles patient records, appointments, billing, and emergency alerts efficiently. The system must run on multiple computers across hospital departments, ensuring data consistency, process synchronization, and timely execution of tasks. The hospital relies on the Operating System to manage hardware, processes, and resources effectively.

Case Study 2: A university wants to develop a Computer Lab Resource Management System (CLRMS) to efficiently manage lab computers, student usage, and printing resources. The system should simulate Operating System concepts such as process scheduling, memory management, and file handling. The goal is to create a simulation program (can be Python, C, or Java) that demonstrates real OS functionalities in a lab environment.

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the Unix environment, W. R. Stevens, Pearson education.

REFERENCE BOOKS:

1. Operating Systems – Internals and Design Principles, William Stallings, Fifth Edition-2005, Pearson Education/PHI.
2. Operating System - A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd edition, Pearson/PHI.
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education.
5. UNIX Internals: The New Frontiers, U. Vahalia, Pearson Education.

CB407PC: ARTIFICIAL INTELLIGENCE LAB

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

PREREQUISITE: Basic knowledge of Python, algorithms, logic, and probability

Course Objectives

1. Understand AI concepts through hands-on problem solving.
2. Apply search strategies to solve AI-based problems.
3. Learn logic-based and knowledge representation techniques.
4. Explore planning and reasoning in intelligent systems.
5. Develop AI models under uncertainty and probabilistic settings.

Course Outcomes: upon completion of course, students will be able to

1. Implement AI search algorithms using Python.
2. Solve constraint satisfaction and game problems.
3. Apply logical inference techniques in AI tasks.
4. Build planning and decision-making AI agents.
5. Develop classifiers using probabilistic learning models.

LIST OF EXPERIMENTS

1 Implement a program for
   i) Breadth-First Search (BFS)
   ii) Depth-First Search (DFS)
   iii) Uniform Cost Search (UCS).

2 Write a Program to
   i) Implement Greedy Best First Search
   ii) A* Search Algorithm

3 Write a Program to
   i) Implement N-Queens problem using Hill Climbing and Simulated Annealing.
   ii) implement table driven vacuum-cleaner agent.

4 Write a program to
   i) Create a Tic-Tac-Toe game using Minimax Algorithm with Alpha-Beta Pruning.
   ii) Implement Water Jug Problem

5 Solve Map Coloring or Sudoku using Backtracking (Constraint Satisfaction Problem).

6 Build a knowledge base and perform inference using Forward and Backward Chaining.

7 Implement First-Order Logic resolution with unification.

8 Implement a simple Classical Planner using STRIPS-style representation.

9 Write a program to implement Bayes algorithm in the given dataset.

RID	Age	Income	Student	Credit_Rating	Class (buys_computer)
1	Youth	high	no	fair	no
2	Youth	high	no	excellent	no
3	middle_aged	high	no	fair	yes
4	Senior	medium	no	fair	yes

5	Senior	low	no	fair	yes
6	senior	low	yes	excellent	no
7	middle_aged	low	yes	excellent	yes
8	youth	medium	no	fair	no
9	youth	low	yes	fair	yes
10	senior	medium	yes	fair	yes
11	youth	medium	yes	excellent	yes
12	middle_aged	medium	no	excellent	yes
13	middle_aged	high	yes	fair	yes
14	senior	medium	no	excellent	no

Find the class label for the unknown tuple using bayes classifier? X=age=youth, income=medium, student=Yes, Credit_Rating=Fair

10 Implement Naive Bayes Classifier on real-world dataset (Using Iris/Titanic, any other Datasets).

Case Study 1:

A warehouse robot used BFS, DFS, and A* search to navigate obstacles and find the shortest path to a target location. A* consistently produced the fastest and optimal routes using heuristics.

Case Study 2:

A company applied the Naive Bayes classifier on customer data to predict who would buy a computer. The model improved decision accuracy and supported better marketing decisions.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach by Stuart Russell & Peter Norvig, Pearson, 4th Edition.
2. Artificial Intelligence by Elaine Rich, Kevin Knight & Shivashankar B. Nair, McGraw Hill, 3rd Edition.

CB408PC: SOFTWARE ENGINEERING LAB

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

Prerequisites: A course on “Programming for Problem Solving”.
Co-requisite: A Course on “Software Engineering”.

Course Objectives:

- To have hands-on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Course Outcomes:

- Ability to translate end-user requirements into system and software requirements
- Ability to generate a high-level design of the system from the software requirements
- Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

List of Experiments

Do the following seven exercises for any two projects given in the list of sample projects or any other Projects:

1. Development of problem statements.
2. Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents.
3. Preparation of Software Configuration Management and Risk Management related documents.
4. Study and usage of any Design phase CASE tool
5. Performing the Design by using any Design phase CASE tools.
6. Develop test cases for unit testing and integration testing
7. Develop test cases for various white box and black box testing techniques.

Sample Projects:

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system

Case Study 1: Currently, clients use multiple tools or manual methods for:

- Calculating compound interest for investments
- Storing personal contacts
- Performing simple numeric or string operations (e.g., prime checks, palindrome checks, sorting validation)

This fragmentation leads to manual errors, time wastage, and inefficient tracking.
The goal is to create a single software solution that integrates these functionalities with:

- Modular design for easy maintenance
- Input validation to prevent errors
- Reusable functions for computation and analysis

Case Study 2: A small financial consultancy firm, FinTech Solutions, wants to develop a Personal Finance & Contact Management System (PFCMS) for its clients. The system is intended to assist clients in financial calculations, data management, and pattern analysis using Python as the primary programming language. The project will be developed using Software Engineering principles, following requirements analysis, design, implementation, and testing phases.

TEXT BOOKS:

1. Software Engineering, A practitioner’s Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill

CB409SD: NODE JS/ REACT JS/ DJANGO

B.Tech. II Year II Sem.	L	T	P	C
	0	0	2	1

Prerequisites: Object Oriented Programming through Java, HTML Basics.

Course Objectives:

1. To implement responsive web pages using HTML, CSS3, Bootstrap, and JavaScript validation.
2. To develop full-stack applications with Node.js, Express, React.js, and secure them using JWT.
3. To build and integrate RESTful APIs using Node.js and Django with frontend CRUD operations.
4. To create Flutter apps with responsive layouts, state management, and custom widgets.
5. To enhance Flutter apps by integrating REST APIs and adding animations for better user experience.

Course Outcomes:

1. Design responsive web pages using HTML, CSS, Bootstrap, and JavaScript.
2. Develop backend applications using Java and Node.js.
3. Build single-page applications with React.js.
4. Create Flutter apps with custom widgets, layouts, and forms.
5. Integrate APIs, add animations, and perform UI testing in Flutter apps.

List of Experiments: Students need to implement the following experiments

1 Build a responsive website with registration, login, catalog, and cart pages using HTML, CSS3, Bootstrap, and JavaScript validation.

2 Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages

3 Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js

4 Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman)

5 Implement JWT authentication in Node.js to create secure endpoints.

6 Create a TODO application in react with necessary components and deploy it into github.

7 Integrate a React frontend with Node.js backend to perform CRUD operations on a shared dataset (e.g., MongoDB, MySQL.)

8 Build a Django REST API for managing student data, tested using Postman.

9 Install Flutter and Dart SDK; Write Dart programs on data types, control flow, Functions, Class & Objects and collections to understand syntax and features.

10 Create a Flutter app showcasing common widgets (Text, Image, Container, Card, ListView).

11 Design a responsive UI using Row, Column, Stack, media queries, and breakpoints.

12 Implement screen navigation using Navigator and named routes.

13 Use stateful & stateless widgets; manage state using Provider or setState.

14 Design a form in Flutter with input fields, validation, and error handling (e.g., student registration form).

15 Fetch and display data from a REST API (e.g., weather or student info) in Flutter.

16 Add basic animations (fade or slide) to a Flutter app for enhancing UI interactions

Case Study 1: A startup wants to develop an Online Event Management Platform where users can create, manage, and register for events. The platform should work in real-time, allowing users to see updates instantly when new events are added or registration status changes.

Case Study 2: A fintech startup wants to develop a web application to help users manage their personal finances and contacts efficiently. The system should allow users to:

1. Calculate financial metrics like compound interest.
2. Store and manage personal contact details securely.
3. Perform basic utility functions (like palindrome checks, pattern printing for learning).
4. Share or visualize data interactively on the frontend.

The application should be responsive, real-time, and modular, suitable for web and mobile devices.

TEXT BOOK:

1. Marco L. Napoli, Beginning Flutter: A Hands-on Guide to App Development.

REFERENCE BOOKS:

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2nd Edition, A Press.

VA400HS: INDIAN KNOWLEDGE SYSTEM

B.Tech. II Year II Sem.	**L**	**T**	**P**	**C**
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Bharat is considered one of the oldest civilizations of the world. Some of the archaeological evidences proved the existence of Indus Valley Civilization in 7000 B.C. Bhartiya traditions, culture, cultural activities, rituals, sacraments, painting, art of dancing, art of singing etc. is being practised till the modern times without knowing scientific approaches behind that. Eternity of Indian knowledge system proved itself that not only many rituals but also many traditions, many streams of knowledge like astrology, mathematics, physics, chemistry, biology, language studies, yoga and meditation had been following from the starting till now with some changes, in the form of traditions.

This course is for undergraduate students to inculcate Indian values. It will promote advance study and inter disciplinary research on all aspects of the Indian knowledge system.

Course Objectives: This course aims:

1. To provide a tribune of the rich culture and traditions of Indian knowledge system to students of various disciplines.
2. To introduce historical account on the education and scientific literature available in ancient Indian traditions and its connections with ancient Indian Philosophy
3. To give insights about the applications of Bharatiya Jnana Parampara
4. To introduce Indian approach towards health and wellbeing
5. To elaborate vast contribution of ancient Indian researchers, engineers, scientists and architects to the modern world

Course Outcomes: Students will be able to:

1. Understand nature, scope and related fields of Indian knowledge system.
2. Demonstrate the scientific literature available in ancient Indian traditions
3. Understanding the application of Bharatiya Jnana Parampara
4. Understand Indian approach towards Wellbeing
5. Appreciate vast contribution of ancient Indian researchers, engineers, scientists and architects to the modern world

Unit 1: **Introduction to Indian Knowledge Systems**

Meaning**,** Nature, Scope and Salient Aspects of Bharatiya Jnana Parampara - Introduction to Vedas, Upanishads, Vidya, Kala, Jnana, Shastra - Practices and Continuity of Tradition

Unit 2: Overview of History of Indian Education and Scientific Literature

Gurukul System - Role of Sanskrit in Natural Language Processing - Scientific Literature - Vedic Literature - Available Scientific Treatises - Interlinkings

Unit 3: Introduction to Scientific Theories from Pure Sciences from Ancient Indian Knowledge Systems

Overview of theories from available ancient Indian Literature about Physics, Chemistry and Mathematics - Interlinkings and applications

Unit 4: Introduction to Ancient Indian Wellness Systems

Concept of Wellness – Yoga System - Ayurveda System - Ancient Indian Aesthetics

Unit 5: Development of Engineering, Science, Technology & Fine Arts in India

Various Industries - Silk, Cotton and Ship Building - Evolution of Indian Fine Arts – Cave and Temple Architecture, Vastu - Vidya, Sculpture, Forts and Stepwells, Observatories and Paintings - Music and Natyakala - Cultural Traditions & Folk Arts

❖ **Pedagogy for Teachers: Apart from Class Room Instruction, the following Methods are Suggested.**

1. Project based activities and learning.
2. Presentation and case studies.
3. Film screening and book reviews.
4. Visit to historical places, archives centre, research centre or library nearby.

***Note**: Activities mentioned above are only suggestive. Teacher-educators should encourage students to be innovative.*

Suggested Readings:

1. B. Mahadevan, Bhat Vinayak and Nagendra Pavan R.N., (2022) '*Introduction to Indian Knowledge Systems: Concepts and Applications*' PHI learning PVT, New Delhi ISBN [9789391818203]
2. Dharmapal (1971) '*Indian Science and Technology in the Eighteenth Century*'. Other India Press, Goa.
3. Kapil Kapoor, Singh Avdhesh Kumar, (2005) '*Indian Knowledge Systems*' D.K. Printworld (P) Ltd. ISBN 10: 8124603367 / ISBN 13: 9788124603369
4. Chakradeo, Ujwala, Temples of Bharat, Aayu Publications, New Delhi, 2024.
5. D.N. Bose, S.N. Sen and B. V. Subbarayappa, *A Concise History of Science in India*, Indian National Science Academy, New Delhi, 2009.
6. Datta B. and A. N. Singh, *History of Hindu Mathematics: Parts I and II*, Asia Publishing House, Bombay, 1962.
7. Kapoor, K. (2021), *Indian Knowledge System: Nature, Philosophy, Character in Indian Knowledge System*, vol. 1, Pub. Indian Institute of Advanced Studies, Shimla
8. Mahadevan, B., Bhat, V.R., Pavana, N. (2022), Philosophical Systems, in Introduction to Indian Knowledge System, Pub. PHI Learning, New Delhi.
9. Mahadevan, B., Bhat, V.R., Pavana, N. (2022), Knowledge: Framework and Classification, in Introduction to Indian Knowledge System, Pub. PHI Learning, New Delhi.

Video Resources:

1. Introductory lectures by Prof. Gauri Mahulikar
2. Introductory lectures by Prof. Kapil Kapoor

Websites:

- https://iksin dia.org/index.php
- Official Website of IKS- Indian Knowledge System
- https://www.youtube.com/watch?v=uKcf-hSlcUE
- Address by Prof Kapil Kapoor | Indian Institute of Advanced Study (FDP 2021)
- https://www.youtube.com/watch?v=MDJTXNiH2_A
- Mukul Kanitkar on Bharatiya Knowledge System
- https://www.youtube.com/watch?v=uARMhv97pjk
- https://www.youtube.com/watch?v=oTwgf56GbsA
- Scientific History of India | Mukul Kanitkar Lecture in DTU
- https://youtu.be/gNJNmPJqXJc?si=WFBbuUT65mLZzpOW
- Ancient India's Scientific Achievements & Contribution in Mathematics, Astronomy, Science & Medicine