JECRC™
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School of Engineering

Syllabi and Course Structure

B. Tech. (Computer Science & Engineering)
AI&ML(Xabia)
(2025-2029)
Academic Programmes

JULY 2025

The curriculum and syllabus for B.Tech. Program conforms to outcome based teaching learning process. In general, several outcomes have been identified and the curriculum and syllabus have been planned in such a way that each of the courses meets one or more of these outcomes. Student outcomes illustrate the students are expected to know and be able to do by the time of graduation. These relate to the skills, understanding, and behaviorsthatstudents acquire as they progress through the program. Further each course in the program brings out clear instructional objectives which are mapped to the student outcomes.

B.Tech. (CSE) Program Educational Objective (PEO's):
A graduate of the Computer Science and Engineering Program should:

PEO- I

Students will develop themselves as effective professionals by solving real problems through the use of computer science knowledge and with attention to team work, effective communication, critical thinking and problem solving skills.

PEO- II

Students will develop professional skills that prepare them for immediate employment and for life-long learning in advanced areas of computer science and related fields.

PEO- III

Students will demonstrate their ability to adapt to a rapidly changing environment by having learned and applied new skills and new technologies.

PEO- IV

Students will be provided with an educational foundation that prepares them for excellence, leadership roles along diverse career paths with encouragement to professional ethics and active participation needed for a successful career.

Program Outcome(PO's)

A graduate of the Computer Science and Engineering Program will demonstrate:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal andcultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Culture, Values and Ethics: Understand the importance of culture and Values along with the implications it has on learning, teaching, engineering practice, identity, and enculturation as an engineer. Apply ethical principles being committed to professional ethics, responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome:

PSO1: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, cyber security, machine learning and networking for efficient design and automation of computer-based systems of varying complexity. (Professional Skills)

PSO2: The ability to apply standard and modern practices like Python, R language, automation and strategies in software project development using open-ended programming environments to deliver a quality product for business success. (Problem-Solving Skills)

PSO3: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths in the field of AI and Machine learning, Cloud Computing, Robotic automation, cyber security to be an entrepreneur, and a zest for higher studies.(Successful Career and Entrepreneurship)

B. Tech. (common to all disciplines)-I/II Semester

(Common to all disciplines at UG Level)-I Semester
Contact Hours (L-T-P): 2-0-2

DEN001C	***Communication Skills***	***Credits 1-0-1 2***

Course Objectives

1. *To enhance English language competence in reading, writing, listening and speaking.*
2. *Switch the approach from teacher-centred to student-centred one.*
3. *Minimize the Grammar Translation Method of ELT while trying to replace it with Direct Method.*
4. *Introduce Communicative Method of ELT and focusing the teaching pedagogy on the student-centred learning rather than on the teacher-centred learning.*
5. *To link communication skills with the organizational behaviour.*
6. *To inculcate skills which are very much required for employability and adjust in the professional environment.*

Course Outcomes (CO):

At the end of this course students will have:

CO1: Ability to design a language component or process to meet desired need within realistic, Constraints such as economic, environmental, social, political, ethical, scenario
CO2: Ability to analyze the usage of English words in different contexts.
CO3: An understanding of technical and academic articles' comprehension.
CO4: The ability to present oneself at multinational levels knowing the type of different standards of English
CO5: Ability to showcase employability skills and professional writing skills

Syllabus: Theory

UNIT 1	***Basics of Organizational Communication:*** *Communication: Meaning, Elements, Process, Types, Flows of Communication and Barriers to communication, basics of professional communication and professional ethics including Time-management, Respect for deadlines and corporate culture*
UNIT 2	***Basic Writing Skills:*** *Parts of Speech, Elements of Sentences, Sentence types based on meaning and structure, Tenses, Voice, Narration*
UNIT 3	***Composition:****, Basics of Letter Writing, Email Writing, Précis Writing, Essay Writing,*
UNIT 4	***Vocabulary Building:*** *Word Formation from one word form to another, Origin of Words, Affixes, Synonyms, Antonyms*
UNIT 5	***Professional and Technical Communication :*** *Basics of Drafting a CV/Resume, Basics of Telephonic Interview and Online Interview, Basics of PPT presentation*

Syllabus: Lab DEN001D

UNIT 1	***Basics of Organizational Communication:*** *Role Plays and presentations related to different corporate related matters- How to greet, how to deny politely, how to handle different types of problems related to the types of communication, how to avoid grapevine and use it in a positive manner, how to keep positive mindset during work pressure, Activities to teach Time-management, Following Deadlines etc*
UNIT 2	***Write Dialogue from the different contexts of corporate culture:*** *Employee and Employer, Customer and Service Provider, Customer and Product Review, How to react on Day to day corporate interactions- Memo, Notice, Email, Circular etc*
UNIT 3	***Composition:****, Letter Writing, Email Writing, Précis Writing, Essay Writing, Practice sessions by using Ms Word- Following the process of Drafting-Redrafting, Proof Reading, Editing etc*
UNIT 4	***Vocabulary Building:*** *Word Formation from one word form to another, Origin of Words, Affixes, Synonyms, Antonyms- Using video clips and comprehension passages to find out the difference between words, similarity between words, origin of words, neologism concepts etc*
UNIT 5	***Professional and Technical Communication :*** *Drafting a CV/Resume, Practice Sessions on Telephonic Interview and Online Interview, Presenting projects, proposals etc through PPT Making,*

Methodology for Evaluation

1. *Internal Assessment (Theory)*
   a) *Home Assignments: One from each Unit : 15 Marks*
   b) *In Semester Tests (Minimum two) : 30 Marks*
   c) *Attendance : 05 Marks*
2. *Term End (Theory) : 50 Marks*
3. *Internal Assessment (Lab)*
   (a) *Daily Performance in the Lab : 50 Marks*
4. *Term End (Lab) : 50 Marks*

Course Articulation Matrix: (Mapping of COs with POs andPSOs)

Course Outcome	Program Outcome							Program Specific Outcome					
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3					2	3	3	2	3	3
CO2	2	3	3					1	2	3	3	3	2
CO3	3	2	1				3		1	3	2	2	3
CO4	2	3	3					2	2	3	3	3	3
CO5	3	3	3				3	3	1	1	3	3	3

Suggested Reading:

A. *Practical English Usage. Michael Swan. OUP. 1995*

B. *Remedial English Grammar. F.T. Wood. Macmillan. 2007*

C. *Raymond V. Lesikar and Marie E. Flatley. Basic Business Communication, Tata McGraw Hill Pub. Co. New Delhi. 2005. Tenth Edition.*

D. *On Writing Well. William Zinsser. Harper Resource Book. 2001*

E. *Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.*

F. *Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.*

G. *Exercises in Spoken English. Parts. I-III, Hyderabad. Oxford University Press.*

H. *Syamala, V. Speak English in Four Easy Steps, Improve English Foundation Trivandrum: 2006*

I. *More Games Teams Play, by Leslie Bendaly, McGraw-Hill Ryerson.*

J. *The BBC and British Council online resources*

B. Tech. (common to all disciplines)-I Semester
Contact Hours (L-T-P): 3-1-0

DMA001A	**Engineering Mathematics-I**	**3: 1:0 4**

OBJECTIVE:
The objectives of this course are to make the students:

- To increase the student's appreciation of the basic role played by mathematics in modern technology.
- Incorporate the knowledge of advanced mathematics to support their concurrent and subsequent engineering studies.
- To develop the conceptsandtoolsthatwillserve asbuildingblockstowards tacklingmoreadvancedlevelofmathematicsthatthey arelikely tofindusefulintheirprofession whenemployedinthefirm/industry/corporationinpublic or privatesector

UNIT 1	Point of inflexion and curve tracing (Cartesian coordinates only), curvature, convexity, concavity, point of inflexion and curve tracing.
UNIT 2	Limit, continuity and partial derivatives, Euler's theorem on homogenous functions, total derivative, approximate calculations; Maxima and minima of two and more independent variables; Method of Lagrange multipliers.
UNIT 3	Beta and Gamma functions and their properties. Surface and volumes of solids of revolutions. Double integrals, change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes.
UNIT 4	Vectors covering,lawsof vectoralgebra,operations- dot,cross,triple products;Vector function-limits,continuityandderivatives,geometricinterpretation; Gradient,divergenceand cur-formulae.
UNIT 5	Lineintegrals,simpleconnectedregions,Lineintegrals, surface integrals, volume integral, Green's theorem, Stokestheorem and Gauss theorem.

Text Books:

1. B.V.Ramana, Higher Engineering Mathematics, Tata McGraw Hill, 2011.

Reference Books:

1. Erwin Kreyszig , Advanced Engineering Mathematics, Wiley 9th Edition, 2008
2. Maurice D. Weir and Joel Hass, Thomas Calculus, Pearson, 11th Edition, 2005.
3. Higher Engineering Mathematics- B. S. Grewal, Khanna Publications.

Course Outcomes

Upon successful completion of this course, the student will be able to:

CO1 Understand the concepts of Asymptotes, curvature and curve tracing.
CO2 Understand the functions of more than one independent variable and calculate partial derivatives along with their applications .Also obtain an idea for finding the extreme values of functions of more the one variable.
CO3 Will able to integrate a continuous function of two or three variables over a bounded region and able to trace the curves.
CO4 Understand the representation of vector and its properties.

CO5 Understand line integral, surface integrals, volume integral, Green's theorem, Stokestheorem and Gauss theorem

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	H	H			M		M					M	H	L	
CO2		M		L	M		H				L	M	M		
CO3	H	H		M	M		H			L		M	M	M	
CO4	H	M		M	L		M					M		M	
CO5	H	H			M		H					M	H	M	

H = Highly Related; M = Medium L = Low

B. Tech. (common to all disciplines)-I/II Semester
Contact Hours (L-T-P): 3-0-2

DPH001B	APPLIED PHYSICS	Total Credits: 3

Course Objectives:

1. Students will be able to demonstrate competency and profound understanding of physics relevant to the various streams of engineering and technology.
2. Students will be able better to understand and learn the concepts of Quantum Mechanics and its applications.
3. Students will be able acquire the knowledge of semiconductors, laser system to meet desired needs within realistic constraints such as health and safety, manufacturability.
4. The graduates will able to understand the applications of quantum optics through Holography and communication through optical fibers and application of optical technologies.

UNIT 1	**Introduction to Quantum Mechanics:** Development of Quantum Mechanics, Compton Scattering, Uncertainty's Principle, Wave Particle Duality, Phase and Group velocities, Wave Packet, - Physical significance and its properties, Operators, Expectation values. Schrödinger's time dependent and time independent equations. **Applications:** Motion of a particle in one-dimensional box and three-dimensional box, Concept of Non-degeneracy and Degeneracy. Qualitative: Quantum Tunnelling (Barrier penetration) - **Alpha Decay**.
UNIT 2	**Free Electron Theory and Band Theory of Solids:** Overview of Drude & Lorentz theory, Quantum (Sommerfield's) theory of free electrons, Density of energy states, Fermi-Dirac Statistics, Fermi level. Band Theory of solids: Formations of band, Classification of Solids - Energy Band Diagram.
UNIT 3	**Semiconductor Devices**: Intrinsic and Extrinsic semiconductors, Carrier concentrations, Position of Fermi levels in semiconductors, Conductivity and Mobility, determination of bandgap, P-N junction diode: Formation, Energy band diagram, Calculation of internal potential barrier, diode equation and V-I characteristics under forward and reverse bias; Zener diode, Varacter diode, LED and Photodiode.
UNIT 4	**Quantum Optics:** **Laser:** Introduction to Coherence; Einstein's coefficients, relations between Einstein's coefficients, Threshold conditions for laser action. Solid-Nd-Yag Laser, Ruby laser, Gaseous-He-Ne, CO2 laser, and Semiconductor laser. **Holography**: Holography versus photography. Construction and re-construction of a Hologram and Applications. **Communication**: Optical fiber-Construction, Numerical Aperture and Angle of Acceptance, fractional refractive index, types of optical fibres and applications
UNIT 5	**Electromagnetic Waves** Scalar and Vector fields, Theorems- Gauss', Stokes and Gradient; Maxwell's equations – Differential and Integral Form, Significance of Equations, Ampere's Law and correction; Wave equation and its solution for free space. Transverse nature of EM waves; Poynting vector and theorem, Applications in communications

Course Outcomes

Upon successful completion of this course, the student will be able to:

CO1: Understand the fundamentals of quantum mechanics to analyze the quantum behavior of matter in its micro state and its applications.

CO2: Analyze and apply quantum theory and quantum statistics in understanding the physics of materials.

CO3: Acquire the experiential learning with demonstration of knowledge about semiconductors and devices role in Electronics.

CO4: Acquire and demonstrate the knowledge about the fundamentals of Lasers and its importance in real life.

CO5: Learn the basics and nature of EM radiations and role in communications.

Suggested Books

1. Arthur Beiser, **Perspectives in Modern Physics**, McGraw Hill International.
2. H. S. Mani and G. K. Mehta, **Modern Physics**, East-West Press.
3. H Malik and AK Singh, **Engineering Physics**, McGraw Hill Education.
4. A. K. Ghatak, **Optics**, Tata McGraw Hill.
5 D. K. Bhattacharya and A. Bhaskaran: **Engineering Physics**, Oxford University Press.
6. S. Mani Naidu, **Engineering Physics**, Pearson.
7. M.N. Avadhanulu, P.G. Kshirsagar, "**A Textbook of Engineering Physics**", S. Chand Publications
8. S. O. Pillai, **Solid State Physics**,Wiley Eastern.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	**Program Outcome**												**Program Specific Outcome**		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	M	M	H	M	L						M	H	M	
CO2	H	H	L	H	M	M						L	H	M	L
CO3	H	H	M		M	M	L	M	H			M	M	H	L
CO4	H	L	M		H	M	L		L			M	M	H	M
CO5	H	L	H	M	H	L						L	M	H	M

H = Highly Related, M = Medium, L = Low.

DCO013A	**Computer Programming and Logical Thinking**	**3: 0:0 3**

Course Objectives

1. To impart adequate knowledge on the need for programming languages and problem-solving techniques.
2. To develop an in-depth understanding of functional and logical concepts of Programming Language
3. To provide exposure to problem-solving through programming skills
4. To familiarize the basic syntax and semantics of programming Language
5. To familiarize the different Operations on arrays, functions, pointers, structures, unions and files

Unit I

Unit–1 Computer Fundamentals**,** Functional units of Computer: I/O devices, Primary and secondary memories Number System: Decimal, Binary, Octal, and hexadecimal, Fixed and floating Points, Character Representations, ASCII, EBCDIC, Binary Arithmetic, Negative Numbers and their Arithmetic, Floating point representation, Binary Codes, Cyclic Codes

Unit–2 Programming Fundamentals**,** Algorithm development, Techniques of Problem-solving, Flowcharting, Stepwise Refinement.

Unit –3 Basic of C Programming**,** Introduction of C language, Representation of Integer, Character, real, Data Types: Constants and Variables, Operators, Arithmetic Expression, Logical expression, Assignment statement, Structure of a C program, Header files, Directives

Unit–4 Programming in C**,** Decision Control Structure, Alteration, and Iterations (While, do while, for loop, switch case), Arrays, String processing,

Unit–5 Advance Concepts in C**,** Functions, Recursion, Pointers, Structure, Union, Files

Course Outcomes (CO)

CO1 Understand the basic structure of computer and numbering methods
CO2 Understand the representations of data and various algorithm
CO3 Choose the right data representation formats based on the requirements of the problem
CO4 Develop programming skills using the fundamentals and basics of Programming Language
CO5 Implement different Operations on arrays, functions, pointers, structures, unions and files

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specifice Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M												M		
CO2			H		H									H	L
CO3			H		M				M		M		H		
CO4				L								M		L	
CO5	H		H	M							M		H	M	L

Reference Books:

1. Introduction to computer by Alexis Leon, Leon Press, Channai.
2. Computer fundamentals And C programming by E. Balagurusamy, The MsGraw-Hill publishing company Ltd.
3. Let us C by YaswantKanitkar.
4. Exploring in C by YaswantKanatkar.

BCO 353A	Foundation of Artificial Intelligence and Machine Learning	3: 0:0 3

OBJECTIVE:

- Understand the basics of Artificial Intelligence (AI) and its evolution.
- Understand the basics of Machine Learning (ML), its origin and how it has evolved over time.
- Enumerate the factors that connect and the commonalities that exist among Machine Learning
- (ML) and Artificial Intelligence (AI)
- Explain the applications of AI and ML in modern context.
- Understand the relevance and application of statistical and mathematical models.

UNIT 1	Introduction and history of AI, Sources of Data, Introduction to AI, A Brief History of Data Science, Introduction to Machine Learning, History of AI, categories of ML systems, An Introduction to AI, ML and AI Overlap with Each Other? Applications of ML, Types of Data, Organization of Structured Data, Examples of Structured Data, Expansion of Structured Data, What is Semi-structured Data?
UNIT 2	Introduction to Statistics, Classification of Statistical Methods, Descriptive Statistics, Inferential Statistics, Scale of Measurements (Nominal, Ordinal, Ratio and Interval), Nominal Scales, Nominal Scales, Ratio Scales, Mean, Median, Mode, Measures of Variability/Spread, range, Quartiles and Interquartile Range, Standard Deviation (SD), Measures of Shape, Skewness, Kurtosis
UNIT 3	Principles of Counting, Introduction and Definitions of Probability Theory, Conditional Probability, Bayes Theorem, Discrete Probability Distribution, Covariance and Correlation, Continuous Probability Distribution, Central Limit Theorem, Hypothesis Testing
UNIT 4	Introduction to Matrices, Matrix Notations and Types, Matrix Equality, Operations on Matrices, Determinants, Singularity of a Matrix, Orthogonal Matrix, Elementary Transformations and elementary matrices, Echelon forms and echelon transformations, Matrix Rank and Normal Form of a matrix, Vector Spaces and the axioms, Linear Dependence and Independence of vectors, Consistency of linear system of equations, Eigenvalues and eigenvectors, Cayley Hamilton Theorem, Linear Transformation and Orthogonal transformation, Matrix Factorization and Types
UNIT 5	Introduction to Linear Algebra, Notations in Linear Algebra, Important Concepts of Linear Algebra, Definitions of Linear Algebra, Introduction to mathematical modeling, Applications of mathematical modeling, Principles and stages involved in developing a mathematical model, Classification of mathematical modelling, Conceptualizing a mathematical model, Concept of boundary conditions

Course OUTCOME (CO):

CO1: Understand the foundation of AI, types of agents and data.
CO2: Analyse the statistical models adopted for realizing AI and ML
CO3: Learn the probability theory and learn the applications.
CO4: Understand the matrices and calculation of eigen values and formulate eigen vectors.
CO5: Learn the concepts and applications of Linear Algebra

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	M	M	M	L		L			L	L			M	L	L
CO2	H	M	M	H	L							L	M	M	
CO3	H	M	M	H								L	M	M	
CO4	H	M	M	H								L	M	M	
CO5	H	M	M	M								L	M	M	

H = Highly Related; M = Medium; L = Low

Text Books:

1. Artificial Intelligence – A Modern Approach (3rd Edition): By – Stuart Russell and Peter Norvig

Reference Books:

1. H. K. Dass,"Advanced Engineering Mathematics", S. Chand and Sons.
2. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido

B. Tech. (common to all disciplines)-I/II Semester
Contact Hours (L-T-P): 3-0-2

DPH002B	APPLIED PHYSICS LAB	Total Credits: 1

List of Experiments

Students are required to perform any ten experiments out of the following list of experiments.

1	**Study the V-I characteristics of p-n junction diode under forward and reverse bias.**
2	**Study the V-I characteristics of a zener diode under forward and reverse bias.**
3	To study the V-I characteristics of Solar Cell
4	To determine the Planck's constant "h" by measuring radiations.
5	To study the variation in resistance of a Semiconductor with temperature and to determine its energy bandgap.
6	**Study the temperature dependence of resistivity of a semiconductor (Four probe method) and to determine bandgap of semiconductor materials (Si and Ge).**
7	**Study of various LC and LCR circuits**
8	To determine Resolving power of Telescope.
9	To determine Dispersive Power of a Prism using Mercury light source and Spectrometer.
10	To determine the wavelength of prominent lines of Mercury by using plane Diffraction Grating and Spectrometer.
11	To measure Numerical Aperture of an Optical Fiber.
12	To determine the profile of He-Ne LASER beam.
13	To determine wavelength of Sodium light source using Newton's Rings experiment.
14	*To study shift in fringes in interference experiment using Michelson's interferometer

Course Outcomes-

While graduating, students of the Applied Physics Lab program would be able to:

CO1: Learn the concepts and understandings through the experiments of electrical, electronics, optical and mechanical in engineering disciplines.

CO2: Develop the technical skill by conducting experiments and analyzing the reasons behind.

CO3: Demonstrate the concepts of Quantum optics via using modern tools for better learning.

CO4: Express their theoretical understanding more effectively by performing experiments and simulations.

CO5: Communicate their ideas effectively, both orally and in writing, and function effectively in multidisciplinary teams

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	M	H		M	M						M	H	M	
CO2	H	M	L	M	L							M	H	L	
CO3	M	M	L		H	M						M	H	M	L
CO4		H		M	M			M			M	L	M	H	L
CO5		L						H	H	H		M	M	M	H

H = Highly Related; M = Medium L = Low

B. Tech. (common to all disciplines)-I/II Semester

DCO014A	**Computer Programming and Logical Thinking Lab**	**0:0:2(1 Credit)**

1. Write a program to print a hello world in c .

2. Write a program in c to check even or odd.

3. Write a program to find odd numbers in c.

4. Write a program to print Armstrong numbers from 1 to 500.

5. Write a program for prime numbers between 1 to 100.

6. Write a program to check a palindrome number.

7. Factorial program in c using for loop

8. Write a c program to reverse a given number.

9. Write a program to add the two numbers.

10. Write a program to swap a number using a third variable.

11. write a program to make personal information as in CV.

12 Write a program to print the following pattern.

*

* *

* * *

14 Write a program to print the following pattern.

* * *

* *

*

15 Write a program to reverse an input string in c .

16 Write a program to print addition, multiplication, division, and subtraction of the numbers.

17 Write a program to print a table of any number.

18. Write a program to implement switch case .

19. Write a program to implement Function.

20. Write a program to implement Recursive Function.

21. Write a program to implement structure in C.

22. Write a program to implement UNION in C.

23. Write a program to implement ENUM in C.

BCO570A	*Digital Data and AI Literacy*	**0:0:4(2 Credit)**

Course Objective

1. To equip students with hands-on skills in digital tools, data handling, and artificial intelligence.
2. Understand how to analyze information and present it using charts, graphs, and visual tools
3. Understand basic digital tools and platforms
4. Identify and use digital tools specific to your academic or professional stream.
5. Understand what AI is and how it works in everyday life

Module	Practical Exercise #	Exercise Details
Module-1: *Digital Foundations, Chatbots, their usage & Tools*	1	Creating Login on AI Bots - Gemini, Chat GPT, Grok & Copilot & comparing the output for the same tasks as provided by the instructor.
	2	Write prompts to use Chat GPT as - Interviewer, Doctor, Motivational Speaker, Advertiser & an Excel.
	3	Use ChatGPT to: Generate blog outlines and headlines, Expand bullet points into full paragraphs, Use Grammarly to polish tone and grammar
	4	Create a digital personal portfolio using Google Sites or Notion-Part-1
	5	Create a digital personal portfolio using Google Sites or Notion-Part-2
Module-2 *Data Collection, Quiz & PPT Creation using AI*	6	Google Forms - Part-1: Collect sample data via Google Forms, using various types of question input options & publishing the form for open response from any domain & generating a QR Code.
	7	Google Forms - Part-2: Collect sample data via Google Forms and Clean and organize data using MS Excel
	8	Creating a Quiz on Quizizz.com using AI & publishing the same.
	9	Generate a PPT using PI tool & compare the output with other tools like Gamma.AI & AIPPT.com
Module-3 *Exploring AI & Society*	10	Use Claude.AI to enhance your already prepared Project Reports & also generate a new fresh project report.
	11	Build a simple chatbot using Dialogflow or similar no-code tools.
	12	Use Canva AI to: Generate a poster for a college event
	13	Design a tri-fold brochure for a student club, Use DALL·E or Adobe Firefly to generate background images or illustration
	14	Create a social media post (Instagram/Facebook) promoting a fictional event using AI- generated visuals
Module-4 *Blogging, Summarization, Data Analysis & Multimedia Tasks using AI*	15	Use Lumen5 or Pictory to: Convert a blog or script into a short video, Add AI-generated voiceovers and subtitles
	16	Use Notion, AI to summarize or rephrase content, Write a 300-word blog post on "The Role of AI in Student Life" using AI tools
	17	Using Julius AI create dashboard from the given data set and visualize data using Julius
	18	Using Julius AI Analyze the Sales Data Provided for ABC Corporation & provide summary & insights
	19	Using Otter.AI convert speech to text for meeting audio or sample conversations. Also integrate Otter.AI with google calendar and automatically prepare Meeting Summary & key actions.
	20	Using Magichour.AI & similar AI based applications, generate images for various situations from text commands using AI.
	21	Using Veed.io & similar tools generating Short videos based upon scenarios & situations.
Module-5 Capstone Project	22	Analyze the given data and present the report in form of PPT with Key insights, summary & visualization.
	23	Build a Chabot as per the given instructions.
	24	Prepare a Blog & a Poster for Instagram with AI tools

Course Outcome

CO-1	Student understands basic digital tools and platforms. Learn how to stay safe online by practicing cyber hygiene and responsible digital behavior. Become aware of digital footprints and ethical online conduct.
CO-2	Student learns to collect, clean, and organize data. Student Understand how to analyze information and present it using charts, graphs, and visual tools. Develop basic skills in tools like Excel or Google Sheets.
CO-3	Student understands what AI is and how it works in everyday life. Explore how AI is used in areas like education, health, and social media. Discuss ethical concerns and the social impact of AI.
CO-4	Identify and use digital tools specific to your academic or professional stream. Apply them in projects, research, and real-world problem-solving. Build digital readiness for higher studies or jobs.
CO-5	Student works on a final project that combines everything you've learned. Use digital, data, and AI skills to solve a problem or present a creative idea. Showcase your work to peers or mentors confidently.

CO-PO-PSO Mapping Table (H: High, M: Medium, L: Low)

CO/PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	H	M			M	H	M	L	M	M		M	M		M
CO-2		H		M	M		M		M	H			H	M	
CO-3	M	M	H			M					L		M	M	L
CO-4	H	H	H	H	H	H	H		L	H		H	H	H	
CO-5	H	H	H	H	H	M	H	L				L	H	H	H

B. Tech. (common to all disciplines)-I/II Semester
Contact Hours (L-T-P): 0-0-2

DME001A	**Engineering Graphics with AutoCAD-DME001A**	**Credits:2**

Basic Concepts

Importance of drawing, Basic principles of engineering drawing, Standards and conventions.

Introduction to AutoCAD

Introduction to drafting software, standard tool bar/menus, navigational tools. Co-ordinate system and reference planes. Principles and methods of dimensioning, Scaling Creation of 2-dimensional drawing environment. Selection of drawing size and scale. Sketching of 2D simple geometries, editing and dimensioning of 2D geometries, Layout and printing of drawing.

OrthographicProjections: - Introduction to different types of projections and their uses, Orthographic projection, I angle and III angle projections.

Projection of regular solids and simple objects like tetrahedron, cube, polygonal prism and pyramid etc. Cases of solids placed in different positions with axis, faces and/or side of solids making given angles with reference planes.

Sections

Importance of sectioning, Principles and types of sectioning, cutting plane representation, Sections of solids, Sectional views and true shape of sections, Hatching.

Development of Surfaces

Development of surface of simple and sectioned solids.

Method of drawing projections

Isometric and oblique projections drawing of elements like screws, nuts and bolts, locking, welding and riveting joints and symbols

Text Books:

1. Bhat, N.D.& M. Panchal (2008), Engineering Drawing, Charotar Publishing House
2. James D. Bethune (2015),Engineering Graphics with AutoCAD 2015, Macromedia Press.

Reference Books:

1 Dhawan, R.K. (2007), A Text Book of Engineering Drawing, S. Chand Publications
2 Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

Course Outcomes: After learning the course the students should be able to:-

CO1. Understand the engineering drawing standards and their usage.
CO2. Interpret engineering drawings. Construct and dimension 2-D geometries using CAD software.
CO3.Understand the concepts of orthographic projections and isometric projection.
CO4. Communicate information by graphical means, using also CAD software packages.
CO5. Visualize and understand spatial relationships, and the competence to select anduse appropriate graphical methods for representing design concepts.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome	
	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1				H	L									L
CO2			L		M									H
CO3		M												
CO4					H								H	
CO5	*M*		*M*		H								H	

H = Highly Related; M = Medium L = Low

Text Books:

1. Bhat, N.D.& M. Panchal (2008), Engineering Drawing, Charotar Publishing House

2. Shah, M.B. & B.C. Rana (2008), Engineering Drawing and Computer Graphics, Pearson Education

Reference Books:

1 Dhawan, R.K. (2007), A Text Book of Engineering Drawing, S. Chand Publications

2 Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

B. Tech. (common to all disciplines) II Semester

(Common to all disciplines at UG Level)-II Semester
Contact Hours (L-T-P): 1-0-1

DEN002C	***Professional Skills***	***Credits 1-0-1 2***

Course Objectives

1. *To enhance Professional competence in reading, writing, listening and speaking.*
2. *Switch the approach from providing information about the language to use the language.*
3. *Minimize the Grammar Translation Method of ELT while trying to replace it with Direct Method.*
4. *Introduce Communicative Method of ELT and focusing the teaching pedagogy on the student-centred learning rather than on the teacher-centred learning.*
5. *Ability to master three major forms of communications which are vital in academic and professional settings namely professional presentations, interviews and group communications respectively.*
6. *Providing a deep insight into the techniques for delivering effective presentations, winning job interviews, and actively participating in various forms of group communication.*

Course Outcomes (CO):

At the end of this course students will have:

CO1: Ability to design a language component or process to meet desired need within realistic, Constraints such as economic, environmental, social, political, ethical, scenario
CO2: Ability to analyze the usage of English words in professional scenario.
CO3: An understanding of technical and academic articles' comprehension.
CO4: The ability to present oneself at multinational levels as per the demand of the corporate culture
CO5: Ability to enhance professional writing skills in tune with professional scenario.

Syllabus: Theory

UNIT 1	***Professional Grooming and Professional Culture:*** *Basics of corporate culture, Dressing sense-personal hygiene, Cultural adaptability, Body language components: undesirable and desirable body language, Team-ship, Leadership, Stress and Conflict management*
UNIT 2	***Advanced Grammar:*** *Common errors related to prepositions, articles, models , Conditionals, Determiners etc, Punctuation, Proof-reading and Editing of Documents*
UNIT 3	***Composition:****, Memo, Notice, Circular, Book Review, Research Article, Reports*
UNIT 4	***Vocabulary Building:*** *Words often misspelt, One Word Substitution, Phrasal Verbs, Idioms*
UNIT 5	***Reading Comprehension:*** *Reading different types of documents including Passages, Reports, Technical Essays, Speeches, Research Articles, Newspaper articles, Interviews etc-Skimming and Scanning-Inference and Deduction,*

Syllabus: Lab DEN002B

DEN002D	***Professional Skills Lab***	***Credits 1-0-1 2***

UNIT 1	***Professional Grooming and Professional Culture:*** *Role plays and Activities on Dressing sense-personal hygiene, Cultural adaptability, Body language components: undesirable and desirable body language, Team-ship, Leadership, Stress and Conflict management*
UNIT 2	***Advanced Grammar:*** *Exercise Sessions forCommon errors related to prepositions, articles, models , Conditionals, Determiners etc, Punctuation, Proof-reading and Editing of Documents*
UNIT 3	***Composition:****, Memo, Notice, Circular, Book Review, Research Article, Reports – Giving Assignments based on practical applications, Practice sessions on different topics*
UNIT 4	***Vocabulary Building:*** *Words often misspelt, One Word Substitution, Phrasal Verbs, Idioms- Activities related to the appropriate use of words*
UNIT 5	***Reading Comprehension:*** *Practice Reading Unseen Paragraphs- Finding Suitable title, Summarizing, Analyzing, Finding new words etc*

Course Articulation Matrix: (Mapping of COs with POs andPSOs)

Course Outcome	**Program Outcome**							**Program Specific Outcome**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	3	2	3					2	3	3	2	3	3
CO2	2	2	3					1	2	3	3	3	M
CO3	3	2	1				3		1	3	2	2	3
CO4	2	3	3					2	M	3	3	3	3
CO5	3	3	1					2	2	3	3	3	3

Suggested Readings:

1. *FelixaEskey. Tech Talk, University of Michigan. 2005*
2. *Michael Swan. Practical English Usage, Oxford University Press. 2005*
3. *Anderson, Paul. Technical Communication: A Reader Centered Approach, V Edition, Hercourt, 2003.*
4. *Thampi, G. Balamohan. Meeting the World: Writings on Contemporary Issues. Pearson, 2013.*
5. *Lynch, Tony. Study Listening. New Delhi: CUP, 2008.*
6. *Kenneth, Anderson, Tony Lynch, Joan Mac Lean. Study Speaking. New Delhi: CUP, 2008.*
7. *Marks, Jonathan. English Pronunciation in Use. New Delhi: CUP, 2007.*
8. *Syamala, V. Effective English Communication For You (Functional Grammar, Oral and Written Communication): Emerald, 2002.*

Non Credit Course

DCH004A	**Environmental Sciences**	**2-0-0 0**

The objectives of Environment science are to-

1.Creat an awareness about environmental problems among students
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate public through students to participate in environment protection and environment improvement.
5. Acquiring skills to help the concerned individuals in identifying and solving environmental problems.

UNIT 1	**The Multidisciplinary Nature of Environmental Studies:** The Multidisciplinary Nature of Environmental Studies Definition, scope and importance need for public awareness.
UNIT 2	**Natural Resources Renewable and Non-renewable Resources**: •Natural resources and associated problems. (a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, Case studies. (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. (f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.
UNIT 3	**Ecosystems, Biodiversity and Its Conservation:** •Concept of an ecosystem. •Structure and function of an ecosystem. •Producers, consumers and decomposers. • Energy flow in the ecosystem. Ecological succession. •Food chains, food webs and ecological pyramids. •Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) **Biodiversity and Its Conservation** •Introduction, definition: genetic, species and ecosystem diversity. •Biogeographical classification of India. • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. •Biodiversity at global, National and local levels. •India as a mega-diversity nation. Hot-spots of biodiversity.

	•Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. •Endangered and endemic species of India. • Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.
UNIT 4	**Environmental Pollution:** •Definition ,Causes, effects and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards • Solid waste management: Causes, effects and control measures of urban and industrial wastes. • Role of an individual in prevention of pollution. •Pollution case studies. •Disaster management: Foods, earthquake, cyclone and landslides.
UNIT 5	**Social Issues and the Environment, Human Population and the Environment, Field Work:** • From unsustainable to sustainable development. • Urban problems related to energy. •Water conservation, rain water harvesting, watershed management. • Resettlement and rehabilitation of people; its problems and concerns. Case studies. •Environmental ethics: Issues and possible solutions. •Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. •Wasteland reclamation. • Consumerism and waste products. • Environment Protection Act. • Air (Prevention and Control of Pollution) Act. • Water (Prevention and Control of Pollution) Act. • Wildlife Protection Act. •Forest Conservation Act. •Issues involved in enforcement of environmental legislation. •Public awareness. **Human Population and the Environment** •Population growth, variation among nations. •Population explosion—Family Welfare Programme. • Environment and human health. • Human rights. •Value education. HIV/AIDS. • Women and Child Welfare. •Role of Information Technology in environment and human health. **Field Work** • Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain. • Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. • Study of common plants, insects, birds. •Study of simple ecosystems—pond, river, hill slopes, etc. (Field work equal to **5 lecture hours**) • Case Studies.

Course Outcome (CO)

After the completion of the course, student will be able to:

CO-1: Recognize the history, structure, function, interactions and trends of key socio-environmental systems on personal, organizational and intellectual level regarding our surroundings through different media.

CO-2: Examine the generation of scientific knowledge and how that knowledge is presented, evaluated, framed and applied for environmental protection by conservation of Natural resources.

CO-3: Articulate a coherent philosophy of the environment and consider ethical bases for responding to environmental questions.

CO-4: Understand the role of conservation of resources and public awareness in prevention of pollution and ultimately for the sustainable development of society.

CO-5: Understand the social responsibility towards protection of environment and society

CO/PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO-1	H	M	H	H	H	H	M
CO-2	M	H	H	M	M	H	M
CO-3	M	H	H	L	H	H	H
CO-4	M	M	H	M	H	H	H
CO-5	H	H	H	H	H	H	H

Contact Hours (L-T-P): 0-0-2

DMA002A	**Engineering Mathematics-II**	**3:1:0 [4]**

Objective: At the end of the course, the student should be able to:

- To provide a brief, hands-on overview of ordinary differential equations and Higher order linear differential equation with constant coefficients.
- To understand the second order linear differential equations with variable coefficients.
- To make utilization of Linear Partial differentialequations–someimportantequations Heat, wave and Laplace equation.
- To understand the Laplace transform, Inverse Laplace transform and their applications
- To familiarize and Analyzenumerical solution of a differential equation by Euler's, Modified Euler's, Predictor Corrector and Runge Kutta fourth order Methods.

UNIT1	Introduction, Elementary row and column transformations ,Linear dependence, Consistency of linear system of equations, Inverse of a matrix, Rank of a Matrix, System of linear equations (Homogenous and Non-homogeneous);Eigenvaluesandeigenvectors, Cayley's Hamilton theorem.
UNIT2	Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions.
UNIT3	Ordinarydifferential equation (first order first degree), Homogenous differential Equation, Linear differential equation, Exact differential equation, Higher order linear differential equation with constant coefficients.
UNIT4	Linearequations withvariablecoefficients: Homogenous form, Exact form, Change of dependent variable, Normal form, Change of independent variable and method of variation of parameters.
UNIT 5	Series solutions of second order linear differential equations with variable coefficients (Complementary functions only). First order partial differential equations, solutions of first order linear and non-linear PDEs.

Text Books: 1. B.V.Ramana, Higher Engineering Mathematics, Tata McGraw Hill, 2011.**Reference Books:**

Recommended Books:1. Erwin Kreyszig , Advanced Engineering Mathematics, Wiley 9th Edition, 2008

2. Thomas and Finney, Calculus and Analytical Geometry, Narosa Publishing House. New Delhi, 2002.

3. M.Ray and Chaturvedi, A Text Book of Differential Equations, Students Friends & Co. Publisher, Agra, 1998.

4. Maurice D. Weir and Joel Hass, Thomas Calculus, Pearson, 11th Edition, 2005.

Outcomes:

At the end of this course, students will be able to:

CO1: Use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra. Understand the definitions of Vector Space and its linear Independence.Solve Eigen value problems and apply Cayley Hamilton Theorem.

CO2: Understanding convergence of sequence and series.

CO3: Identify, analyze and subsequently solve physical situations whose behavior can be described by First order and first degree ordinary differential equations and Higher order linear differential equation with constant coefficients.

CO4: Determine solutions to second order linear differential equations with variable coefficients.

CO5: Understanding the series solutions of second order linear differential equations with variable coefficients

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specifice Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	H	M	L	L	M				L			L	M		
CO2	H	M	M	M	M				L			L	H		
CO3	H	M	M	M	M		M		L			L		H	M
CO4	H	H	M	M	M			L	L			L			M
CO5	H	H	M	M	M	L			L			L	H		

H = Highly Related; M = Medium L=Low

B. Tech. (common to all disciplines)-II Semester
Contact Hours (L-T-P): 3-0-0

DEE003A	***Basic Electrical and Electronics Engineering***	***3-0-0***

Objective

- *To understand basic concepts required in understanding electrical and electronic circuits*
- *To understand the concept of Semiconductor Diode and their applications.*
- *The student will be able to understand fundamental circuit analysis techniques and basic electronics backgrounds, including PN Diode and Opto-Electronic Devices.*
- *To understand basic concepts of construction and working of single phase Transformer.*
- *To understand basic concepts of Electrical DC Circuit.*
- *The student will be able to understand the concept of Various Binary Number Systems and conversions.*
- *To understand Logic Gates and Logic Circuit focusing on basic and universal gates.*

UNIT 1	***Electrical-DC Circuit–*** *Ohm's law, Kirchoff's Current Law(KCL) &Kirchoff's Voltage Law (KVL), Voltage & Current Sources, Star-Delta and Delta-Star transformations, Nodal & Mesh Analysis.*
UNIT 2	***Transformers -*** *Principle of operation and construction of single phase transformers (core and shell types). EMF equation, losses, efficiency and voltage regulation*
UNIT 3	***Semiconductors-*** *Comparison of Insulator, conductor and semiconductor with energy band diagrams. Semiconductor materials-Intrinsic and Extrinsic semiconductor (P-type and N-type SC), Crystal structures of p-type and N type materials, resistivity, conductivity, mobility.*
UNIT 4	***Electronics Devices****- Diode, PN diode-construction, working and V-I plot, Diode as a Rectifier, Half Wave and Full Wave Rectifiers, Zener Diode – construction, Operation, characteristics; Opto-Electronic Devices – LEDs, Photo Diode.*
UNIT 5	***Digital Electronics****-Number Systems: Binary system, Hexadecimal System, Octal system, Decimal system, Code conversions.* ***Basic Logic Gates*** *(AND, OR , NOT), Universal Gates(NAND and NOR) and other gates(EX-OR,EX-NOR), Truth Tables.*

Course Outcome (CO):

At the end of this course students will have:

CO1- To understand, analyze and solve DC electrical circuits

CO2- To understand basic concepts of construction and working of single phase Transformer.

CO3- Ability to understand the physical properties of different types of semiconductors used in fabricating devices.

CO4- Ability to understand the functioning of PN junction diode and explains its main application as rectifiers and opto-electronic devices.

CO5- Ability to understand the concept of Various Binary Number Systems and Codes, Logic Gates and Logic Circuit.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	*Program Outcome*												*Program Specific Outcome*		
	PO1	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*	*PO12*	*PSO1*	*PSO2*	*PSO3*
CO1	*H*	*H*										*H*	*H*	*H*	*H*
CO2	*H*	*L*				*L*		*H*				*H*	*H*	*H*	*H*
CO3	*H*	*L*	*H*	*M*	*L*							*H*	*H*	*H*	*H*
CO4	*H*			*H*	*H*				*H*			*H*	*H*	*H*	*H*
CO5	*H*	*L*				*M*	*M*					*H*	*H*	*H*	*H*

H = Highly Related; M = Medium L = Low

Text Books:

R. L. Boylestad& Louis Nashlesky (2007), Electronic Devices &Circuit Theory, Pearson Education

Reference Books

SantiramKal (2002), Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India
David A. Bell (2008), Electronic Devices and Circuits, Oxford University Press
Thomas L. Floyd and R. P. Jain (2009), Digital Fundamentals, Pearson Education
R. S. Sedha (2010), A Text Book of Electronic Devices and Circuits, S.Chand&Co.R. T. Paynter (2009), Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education

DCO001B	Computer Programming in C++	2: 0:0 2

OBJECTIVE:

- To perform object oriented programming solution and develop solutions to problems demonstrating usage of control structure, modularity, classes, I/O and the scope of the class members
- To demonstrate adeptness of object oriented programming in developing solution to problems demonstrating usage of data abstraction, encapsulation and inheritance
- To demonstrate ability to implement one or more patterns involving dynamic binding and utilization of polymorphism in the solution of problems
- To learn syntax and features of exception handling
- To demonstrate the ability to implement solution to various I/O manipulation operations and the ability to create two-dimensional graphic components using applets

UNIT 1	C++ Overview, C++ Characteristics, Object-Oriented Terminology, Polymorphism, encapsulation ,inheritance, Abstract Data Types, I/O Services, , Functions and Variables. Declaration and Definition.
UNIT 2	Variables: Dynamic Creation and Derived DataClasses in C++, Defining Classes in C++, Classes and Encapsulation, Member Functions, Friend function ,Inline function
UNIT 3	Using Constructors, Using Destructors to Destroy Instances, Using Destructors to Destroy Instances, Operator Overloading: operator overloading of unary and binary operator, Function Overloading, Working with Overloaded Operator Methods
UNIT 4	Constant and Static Class Members, Inheritance, Overview of Inheritance, Defining Base and Derived Classes, Single, Multiple, multilevel, hybrid hierarchical inheritance, virtual function, virtual base class,
UNIT 5	Input and Output in C++ Programs, Standard Streams, Manipulators, Unformatted Input and Output. Working with files.

Course Outcome (CO):

At the end of this course, students will demonstrate ability to:

CO1: Understand object-oriented programming features in C++,

CO2: Apply these features to program design and implementation,

CO3: Develop applications using Object Oriented Programming Concepts.

CO4: Implement features of object oriented programming to solve real world problems.

CO5:Develop the ability to implement software in high-level programming language like C++

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome	Program Specifice Outcome

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	M												M		
CO2			H		H									H	L
CO3			H		M				M		M		H		
CO4				L								M		L	
CO5	H		H		M			L	M				H	M	

Text Books

1. Let Us C: BalaGuruswamy, TATA McGraw Hill.
2. Programming with C, C++: Yashwant Kanetkar

Reference Books

1. C++:The Complete Reference.
2. The C++ Programming Language:BjarneStroustrup

BCO 354A	**PYTHON PROGRAMMING**	**3-1-0 [4]**

OBJECTIVE:

- Explain how to get the Python environment up and running and the basics of Python programming language.
- Describe how to program using Python, by learning concepts like variables, flow controls, data types, type conversion, objects, and classes; functions and how they are considered as objects; basics of iterators and generators; Python as a functional programming language and the concepts that help understand the functional programming aspect.
- Discuss the methods involved in data preprocessing and how outliers can be detected and treated.
- Define the basic concepts of exploratory data analysis and statistical modeling.

UNIT 1	Compiler vs. Interpreter, statically vs. Dynamically Typed Languages, Introduction to Python, Installing Python, Anaconda, Jupyter Notebook, Spyder, Components and Versions of Python, Difference between Python 2 and Python 3, Python Distributions
UNIT 2	Python REPL, Variables, control structures, functions and objects, First-class functions, immutable data, strict and non-strict evaluation, Recursion instead of an explicit loop state, Functions, iterators, and generators, writing pure functions, functions as first-class objects, Using strings, tuples and named tuples,
UNIT 3	Using lists, dicts, and sets, The itertools module, Best practices and clean coding, Reading data files into Python, writing files,, Introduction to Python libraries
UNIT 4	Introduction to Pandas and Basic Concepts of Pandas, Data Cleaning and Preparation, Handling Missing Data, filtering out Missing Data, Filling in Missing Data, Data Transformation, Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers, Permutation and Random Sampling, String Manipulation, Feature Engineering
UNIT 5	Derived Variables, Basic Exploratory Data Analysis, Methods for EDA and Examples, Statistical Modeling, Curve Fitting: Linear Regression, Nonlinear Regression

Course OUTCOME (CO):

CO1: Understand working with the IDEs and installation of important libraries.
CO2: Understand Python flow, structure, and functions.
CO3: Explore working with Python Lists
CO4: Explore the key concepts of pandas and data transformation.
CO5: Understand the working of derived variables.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	M	M	L	L		L			L	L			M	H	L
CO2	M	H	H	H	L							L	M	H	M
CO3	M	H	H	H				L				L	M	H	M
CO4	M	H	H	H			L				L	L	M	H	M
CO5	M	M	M	M					L			L	M	H	M

H = Highly Related; M = Medium; L = Low

Text Books:

1. Head-First Python, 2nd edition: Paul Barry (O'Reilly, 2016)

Reference Books:

a. Dive into Python, Mike
b. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido

BCO 355A	**PYTHON PROGRAMMING Lab**	**3-1-0 [4]**

Python Programming Lab

List of Programs

1. Setting up the Python Environment using Anaconda IDE : Know Jupyter & Spyder
2. Write a program to perform Functions in Python
3. Write a program in Python First Class Functions & Immutable Data
4. Write a program in Python exploring Iterators
5. Write a program in Python exploring Generators
6. Work in Python using Collections
7. Write a program in Python to perform Higher Order Function-I
8. Write a program in Python to perform Higher Order Functions-II
9. Write a program in Python to perform File Operation in Python
10. Write a program in Python to perform Data Preprocessing
11. Write a program in Python to perform Exploratory Data Analysis
12. Write a program in Python to actuate Curve Fitting

Course OUTCOME (CO):

CO1: Understand working with the IDEs and installation of important libraries.
CO2: Understand Python flow, structure, and functions.
CO3: Explore working with Python Lists
CO4: Explore the key concepts of pandas and data transformation.
CO5: Understand the working of derived variables.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	M	M	L	L		L			L	L			M	H	L
CO2	M	H	H	H	L							L	M	H	M
CO3	M	H	H	H				L				L	M	H	M
CO4	M	H	H	H			L				L	L	M	H	M
CO5	M	M	M	M					L			L	M	H	M

H = Highly Related; M = Medium; L = Low

Text Books:

2. Head-First Python, 2nd edition: Paul Barry (O'Reilly, 2016)

Reference Books:

c. Dive into Python, Mike
d. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido

DCO018A	Advanced Excel	0-0-4(2 Credits)

Course Objectives:

1. To enable students to understand and apply essential features of Microsoft Excel.

2. To develop skills in data entry, formatting, charting, and formula usage.

3. To introduce students to advanced Excel functionalities like pivot tables, lookup functions, and data analysis tools.

4. To encourage the use of Excel for solving real-world problems and preparing reports.

5. To build confidence in creating automated tasks using Excel macros and dashboards.

Module-wise Lab Exercise

Module 1: Excel Basics & Formatting

1. Introduction to Excel Interface and Cell Referencing (Relative, Absolute, Mixed)
2. Data Entry and AutoFill Techniques
3. Formatting Cells: Font, Color, Borders, Cell Styles
4. Conditional Formatting Rules (Text, Numbers, Dates)
5. Use of Find, Replace, and Data Sorting

Module 2: Functions and Formulas

1. Basic Functions: SUM, AVERAGE, MIN, MAX, COUNT
2. Conditional Functions: IF, Nested IF
3. Logical Functions: AND, OR, NOT
4. Lookup Functions: VLOOKUP, HLOOKUP
5. Text Functions: LEFT, RIGHT, MID, LEN, CONCATENATE

Module 3: Data Analysis Tools

1. Date and Time Functions: TODAY, NOW, NETWORKDAYS
2. Data Validation: Drop-down lists and Input Restrictions
3. Sorting and Filtering Data (Custom Filters)
4. Charts: Column, Line, Pie, Bar, Combo Charts
5. Creating and Using Pivot Tables and Pivot Charts

Module 4: Advanced Excel Usage

1. Use of Named Ranges
2. What-If Analysis: Goal Seek and Data Tables
3. Scenario Manager and Solver Tool
4. Data Consolidation and Subtotals
5. Creating and Using Macros for Automation

Module 5: Capstone Excel Projects

1. Create a Dashboard with Linked Charts and KPIs

2. Prepare a Sales Report with Pivot Table Analysis
3. Design a Student Marksheet with Conditional Formatting and Summary Table
4. Final Project: Prepare and Present a Business Report Using Excel (Data + Visualization)

Course Outcomes:

CO-1: Student understands and applies basic Excel operations and formatting tools.

CO-2: Student developed proficiency in using formulas, functions, and logical expressions.

CO-3: Student has analyzed data using Pivot Tables, Charts, and What-If tools.

CO-4: Student has Automate tasks using Macros and design interactive dashboards.

CO-5: Students has applied Excel tools in real-world scenarios through hands-on projects.

CO\PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H				M										
CO2	H	M			M								M		
CO3	H	M	M		H								M	M	
CO4			H	M	H				M	M	M	M	M	M	M
CO5	M	M	M	M	M	L	L	L	M	M	M	M	M	M	M

DCO**002B**	Computer Programming in C++Lab	**0:0:4(2 credit)**

[1].C++ Program to Add Two Matrix Using Multi-dimensional Arrays.

[2]. Write a C++ program to demonstrate the use of scope resolution operator.

[3]. Write a program for understanding of C++ program structure without any CLASS declaration. Program may be based on simple input output, understanding of keyword using.

[4]. Write a Program to Understand Structure & Unions.

[5]. Write a program in C++ to define class Person having multiple data members for storing the different details of person e.g. name, age, address, height.

[6]. Write a C++ program to demonstrate concept of declaration of class with public & private member, constructors, object creation using constructors, access restrictions, defining member functions within and outside a class.accessing an object's data members and functions through different type of object .

[7]. Write a Program, involving multiple classes (without inheritance) to accomplish a task demonstrate composition of class.

[8]. Write a Program to Demonstrate Friend function and bridging gap of two classes using friend function.

[9]. Write a program to demonstrate use of friend class in c++.

[10]. Write a Program to Demonstrate Inline functions.

[11]. Write a Program to Demonstrate pointers to derived classes.

[12]. Write a Program to demonstrate dynamic memory management using new & delete & static class members.

[13].Write a Program to demonstrate an operator overloading, operator functions as member function and or friend function, overloading stream insertion and stream extraction, operators, overloading operators etc.

[14]. Write a Program to demonstrate use of protected members, public & private protected classes, multilevel inheritance etc.

[15]. Write a Program for multiple inheritance, virtual functions, virtual base classes, abstract classes.

[16]. Write a C++ program to demonstrate order of invocation of constructor and destructor in multiple inheritance.

[17]. Write a C++ program to show the order of constructor call in single inheritance.

[18].Write a Program to Demonstrate use different type of Constructors and Destructors in single inheritance.

[19].Write a C++ program that demonstrates the concept of function overriding.

[20]. Write a C++ program to swap data using function templates.

[21]. Write a program to demonstrate the use of pure virtual functions and abstract class.

[22]. Write a program to implement basic operation of ios class setf,unsetf,precision etc.

[23]. Write a program to demonstrate use of manipulators in c++.

[24]. Write a program to demonstrate unformatted input output operations .

DCO006A	**Engineering Workshop CSE**	**0-0-2(1)**

1. Introduction to PC Hardware
    a. RAM, ROM, Motherboard, SMPS, Processor
2. Hardware installation and assembly of PC
    a. Desktop
    b. Laptop
3. PC debugging, troubleshooting and Maintenance
4. Software installation and Configuration
    a. Installation of operating System (Windows, Linux/UNIX, Server)
    b. Basic utility and maintenance software
5. Working and functioning of different Buses, I/O Ports, graphic cards.
6. Installation of printer / modem /scanner and other input and output devices.
7. Configuring BIOS set up, Recovery, Preventive maintenance & Anti-Virus
8. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool
9. Configuring and Practically implement Network Devices
    a. Repeater
    b. Hub
    c. Switch
    d. Bridge
    e. Router
    f. Gate Way
10. Install and Configure Wired and Wireless NIC and transfer files between systems in LAN and Wireless LAN.
11. Connect the computers in Local Area Network.
12. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network
13. Installation of Ms Office 200x.

DEPARTMENT OF LAW ; JECRC UNIVERSITY

RECOMMENDED SYLLABUS FOR B TECH FIRST YEAR

DLW001A- CONSTITUIONAL LAW

Ser No	Recommended Subject	Number of Proposed Lecture
1.	Salient Features of the Indian Constitution	01
2.	Preamble of the Constitution	01
3.	Nature of the Constitution	01
4.	**Fundamental Rights**	
	(a) Articles 12 & 13	01
	(b) Articles 14 to 18	01
	(c) Articles 19	02
	(d) Articles 21	02
	(e) Articles 32 and Writs	01
5.	Directive Principles and Fundamental Duties	02

B.Tech CSE Semester III

BCO011B	COMPUTER NETWORKS	3-1-0 [4]

OBJECTIVES:

- To build an understanding of the fundamental concepts of computer networking.
- To familiarize the student with the basic taxonomy and terminology of the computer networking area.
- To introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
- To allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

UNIT 1	**Introduction:** Hardware and software, Data communication, Networking, Protocols and standards. Data transmission concepts. Analog and digital transmission. Transmission impairments. Layered Architecture of Computer Networks, OSI and TCP/IP architectures **Physical Layer -** Guided transmission media and wireless transmission,Data communication interface - asynchronous and synchronous transmission, Multiplexing
UNIT 2	**Link Layer** :Medium Access Control- CDMA, ALOHA, and Ethernet; Link Layer Addressing and Forwarding; The Channel Allocation Problem, Multiple Access Protocols, Ethernet, Wireless LANs, Broadband Wireless, Bluetooth, Data Link Layer Switching, Switched networks. Circuit-switched networks, switching concepts, Control signaling. Packet switching principles, Flow control, Error detection and error control. HDLC and other data link protocols.
UNIT 3	**Network Layer:** Network layer design issues, Routing algorithms- Flooding, Shortest path routing, Distance-Vector, Path Vector routing, OSPF routing,, Intra-Domain Routing: Link- State, Hierarchical routing, Broadcast and multicast routings, Routing in the Internet, The network layer in the Internet: IP protocol, ARP and RARP, BOOTP, ICMP, DHCP, Network Address Translation(NAT), Internetworking
UNIT 4	**Transport Layer:** TCP introduction, Reliable/Un- Reliable Transport, TCP, UDP, Congestion Control, Wireless Networks: 802.11 MAC, Efficiency considerations
UNIT 5	**Application Layer**: DNS-The Domain Name System, Electronic Mail, HTTP, FTP, Simple network management protocol (SNMP), The World Wide Web

***Course Outcome (CO) of* Computer Network**

At the end of this course studentswill have:

CO1: To provide an in-depth understanding of the terminology of network and concepts of OSI reference model and TCP/IP model.
CO2: To equip our students with technical concept of protocols, network interfaces, and design/performance issues in networks.
CO3: To be familiar with contemporary issues in networking technologies.
CO4: To be familiar with network tools and to enhance analytical skills to develop innovative solutions.
CO5: To be familiar with message structure used in various type of network applications using the various protocols like SMTP,HTTP,FTP.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H			L									H		
CO2	M		H									L		L	
CO3		M							M				M		L
CO4					H										L
CO5	H	H		M						M	M	L	M	L	

H = Highly Related; M = Medium L = Low

Text Books:

1. Computer Networks, by Andrew S Tanenbaum, PHI. (2010)

Reference Books:

- Data Communications, Computer networking on OSI , by Fred Halsall, Addison Wesley Publishing Co.1998
- Computer Networking -A Top-Down Approach Featuring the Internet ,James F. Kurose and Keith W. Ross ,Addison Wesley Publishing Co. 2004
- Computer Networks: Protocols standards and interfaces , by Uyless Black, Prentice Hall.2002
- Data communication &Networks , by Behrou A. Forouzan, Tata McGraw Hill. 2002
- Data and Computer Communications, by Walliam Stallings, PHI. (2002)

BCO002B	**DATA STRUCTURES AND ALGORITHMS**	**3-1-0 [4]**

OBJECTIVE:

- To study various data structure concepts like Stacks, Queues, Linked List, Trees and Files
- To overview the applications of data structures.
- To be familiar with utilization of data structure techniques in problem solving.
- To have a comprehensive knowledge of data structures and algorithm.
- To carry out asymptotic analysis of algorithm.

UNIT 1	Introduction: Notions of data type, abstract data type and data structures. Importance of algorithms and data structures in programming. Notion of Complexity covering time complexity, space complexity, Worst case complexity & Average case complexity. BigOh Notation, Omega notation, Theta notation. Examples of simple algorithms and illustration of their complexity. Sorting- Bubble sort, selection sort, insertion sort, Quick sort; Heap sort; Merge sort; Analysis of the sorting methods. Selecting the top k elements. Lower bound on sorting.
UNIT 2	Stack ADT, Infix Notation, Prefix Notation and Postfix Notation. Evaluation of Postfix Expression, conversion of Infix to Prefix and Postfix Iteration and Recursion- Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion.
UNIT 3	List ADT. Implementation of lists using arrays and pointers. Stack ADT. Queue ADT. Implementation of stacks and queues. Dictionaries, Hash tables: open tables and closed tables. Searching technique- Binary search and linear search, link list- single link list, double link list, Insertion and deletion in link list.
UNIT 4	Binary Trees- Definition and traversals: preorder, post order, in order. Common types and properties of binary trees. Binary search trees: insertion and deletion in binary search tree worst case analysis and average case analysis. AVL trees. Priority Queues -Binary heaps: insert and delete min operations and analysis.
UNIT 5	Graph: Basic definitions, Directed Graphs- Data structures for graph representation. Shortest path algorithms: Dijkstra (greedy algorithm) and Operations on graph, Worshall'salgorithm , Depth first search and Breadth-first search. Directed acyclic graphs. Undirected Graphs, Minimal spanning trees and algorithms (Prims and Kruskal) and implementation. Application to the travelling salesman problem.

Course OUTCOME (CO):

CO1: Show the understanding of various data structure concepts like Stacks, Queues, Linked List, Trees and Files

CO2: Understand the applications of data structures.

CO3: Understand with utilization of data structure techniques in problem solving.

CO4: Use comprehensive knowledge of data structures and algorithm.

CO5: Use asymptotic analysis of algorithm.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	**Program Outcome**												**Program Specific Outcome**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H												M		
CO2			H		M								M		
CO3		H							M			L		H	
CO4	H	M											L		L
CO5		M		H											L

H = Highly Related; M = Medium; L = Low

Text Books:

1. Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft , Addison-Wesley Series (1983)

Reference Books:

1. T.H. Cormen, C.E. Leiserson, and R.L. Rivest. Introduction to Algorithms.The MIT Press and
2. McGraw-Hill Book Company, Cambridge, Massacusetts, 1990 (Available in Indian Edition).
3. Steven S. Skiena. The Algorithm Design Manual.Springer, Second Edition, 2008.
4. Data Structures and Algorithm Analysis in Java (3rd Edition) by Mark Allen Weiss, Addison Wesley(2011).

BAS007B	DISCRETE MATHEMATICS	3-0-0 [3]

Objective:

- To introduce a number of Discrete Mathematical Structures (DMS) found to be serving as tools even today in the development of theoretical computer science.
- To solve problems occurred in the development of programming languages.
- Tofamiliarize students with concepts and techniques of graph theory, and sets apart from languages of logic and proof methods.

UNIT 1	**Sets:** Definition and types, Set operations, Partition of set, Cardinality (Inclusion-Exclusion & Addition Principles), Recursive definition of set. Functions: Concept, Some Special Functions (Polynomial, Exponential & Logarithmic, Absolute Value, Floor & Ceiling, Mod &Div Functions), Properties of Functions, Cardinality of Infinite Set, Countable & Uncountable Sets,
UNIT 2	**Graph Theory**: Graphs – Directed, Undirected, Simple,. Adjacency & Incidence, Degree of Vertex, Subgraph, Complete graph, Cycle & Wheel Graph, Bipartite & Complete Bipartite Graph, Weighed Graph, Union of Simple Graphs. Complete Graphs. Isomorphic Graphs, Path, Cycles & Circuits Euclerian& Hamiltonian Graphs. Planar Graph: Kuratowski's Two Graphs, Euler's Formula, Kuratowski's Theorem. Trees: Spanning trees- Kruskal'sAlgo, Finding Spanning Tree using Depth First Search, Breadth First Search, Complexity of Graph, Minimal Spanning Tree.
UNIT 3	**Semigroups, Groups and Coding**: Binary Operations, Semigroups, Products and Quotients of Semigroups, Groups, Product and Quotients of Groups, Coding of Binary Information and Error Correction, Decoding and Error Correction. **Language of Logic**: Proposition, Compound Proposition, Conjunction, Disjunction, Implication, Converse, Inverse &Contrapositive, Biconditional Statements, tautology, Contradiction & Contingency, Logical Equivalences, Quantifiers, Arguments.
UNIT 4	**Proof Methods**: Vacuous, Trivial, Direct, Indirect by Contrapositive and Contradiction, Constructive & Non-constructive proof, Counterexample. The Division Algorithm, Divisibility Properties (Prime Numbers & Composite Numbers), Principle of Mathematical Induction, The Second Principle of Mathematical Induction, Fundamental Theorem of Arithmetic. Algorithm Correctness: Partial Correctness, Loop Invariant. Testing the partial correctness of linear & binary search, bubble & selection sorting.
UNIT 5	Relations: Boolean Matrices, Binary Relation, Adjacency Matrix of Relation, Properties of Relations, Operations on Relations, The Connectivity Relations, Transitive Closure-Warshall's Algorithm, Equivalence relations- Congruence Relations, Equivalence Class, Number of Partitions of a Finite Set, Partial & Total Orderings.

Course Outcome (CO):

At the end of this course, students will demonstrate ability to:

CO1: Demonstrate complete knowledge on various discrete structures available in literature.
CO2: Realization of some satisfaction of having learnt that discrete structures are indeed useful in computer science and engineering.
CO3: Gaining of some confidence on how to deal with problems which may arrive in computer science and engineering in near *future.*
*CO4:*Construct mathematical arguments using logical connectives and quantifiers and verify the correctness of an argument using propositional and predicate logic and truth tables.
CO5:Able to model and solve real world problems using graphs and trees.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L		H		M						L				
CO2		H		H								M	M		
CO3								H	M	L				H	
CO4								H	M	L				H	
CO5								H	M	L				H	

- H = Highly Related; M = Medium L = Low

Text Books

1. B.Kolman et.al- Discrete mathematical Structures, 5th Edn, Pearson Education, New Delhi - 2004.

Reference Books

1. K.H. Rosen – Discrete Mathematics and Its Applications – 4th Edn, Tata McGraw Hill, New Delhi – 2001
2. J.P. Tremblay et.al – Discrete Mathematical Structures with Applications to Computer Science, TMH, New Delhi – 2004.
3. Mott. J.L., Kandel A. and Baker, T.P. "Discrete mathematics", for computer scientists and Mathematicians", Second Edition, Prentice Hall 1986.
4. Tremblay J.P. and Manohar, R. "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill, 1975.

BCO001B	SOFTWARE ENGINEERING	3-0-0 [3]

Objective

- To learn about generic models of software development process.
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the different design techniques and their implementation.
- To learn various testing and maintenance measures

UNIT 1	Introduction- Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Engineering aspects of Software production – necessity of automation .Job responsibilities of Programmers and Software Engineers as Software developers.Software Development Life Cycle (SDLC)
UNIT 2	Process Models and Program Design Techniques- Software Development Process Models – Code & Fix model, Waterfall model, Incremental model, Rapid Prototyping model, Spiral (Evolutionary) model.Software Requirement Specifications (SRS), Management of User Needs, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, Design Techniques – Structured Programming, Coupling and Cohesion, Abstraction and Information Hiding, SoftwareModeling Tools –Data flow Diagrams, UML and XML.
UNIT 3	Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Verification and Validation: Testing of Software Products – Black-Box Testing and White-Box Testing, Static Analysis, Symbolic Execution and Control Flow Graphs –Cyclomatic Complexity.
UNIT 4	Software Project Management: Management Functions and Processes, Project Planning and Control, Organization and Intra-team Communication, Risk Management. Software Cost Estimation – underlying factors of critical concern. Metrics for estimating costs of software products – Function Points. Techniques for software cost estimation –Expert judgment, Work break-down structure and Process breakdown structure, COCOMO and COCOMO-II.
UNIT 5	Software Maintenance,Need for Maintenance, Categories of Maintenance, An Overview of CASE Tools.

Course Outcome (CO):

At the end of this course students will have:

CO1: An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
CO2: An ability to identify, formulates, and solve engineering problems.
CO3: An understanding of professional and ethical responsibility.
CO4: The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specifice Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L		H		M						L				
CO2		H		H								M	M		
CO3								H	M	L				H	
CO4	L		L			L	M								L

H = Highly Related; M = Medium L = Low

Text Books:

1. Fundamentals of Software Engineering – Carlo Ghezziet. Et.al.
2. Software Engineering – Design, Reliability Management – Pressman.

Reference Books:

1. Software Engineering – Ian Sommerville.
2. Software Engineering - Shoeman.
3. Software Engineering with Abstraction – Berzins and Luqi
4. Pankaj Jalote, Software Engineering, Wiley

BCO008B	OPERATING SYSTEMS	3-0-0 [3]

OJECTIVE:

- To understand the structure and functions of OS
- To learn about Processes, Threads and Scheduling algorithms
- To understand the principles of concurrency and Deadlocks
- To learn various memory management schemes
- To study I/O management and File systems

UNIT 1	Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Monolithic and Microkernel Systems.
UNIT 2	Process Management-Process & Threads – Process States - Process Control Block – Process Scheduling – Operations on Processes, Threads, CPU Scheduler – Preemptive and Non- Preemptive; Dispatcher, Scheduling Criteria, Scheduling Algorithms – Process Management in UNIX
UNIT 3	Process Synchronization & Inter process Communication-Concurrent Processes, Co-operating Processes, Precedence Graph, Hierarchy of Processes, Critical Section Problem – Two process solution, Synchronization Hardware, Semaphores – Deadlock- detection, handling, prevention, avoidance, recovery, Starvation, Critical Regions, Monitors, Inter process communication
UNIT 4	Memory Management-Objectives and functions, Simple Resident Monitor Program (No design), Overlays – Swapping; Schemes – Paging – Simple, Multi-level Paging; Internal and External Fragmentation; Virtual Memory Concept, Demand Paging – Page Interrupt Fault, Page Replacement Algorithms; Segmentation – Simple, Multi-level, Segmentation with Paging, Memory Management in UNIX.
UNIT 5	I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

Course Outcome (CO):

At the ends of this course studentswill have:

CO1: Classify Unix Kernel mode with user mode & contrast between Kernel structures.
CO2: Identify and estimate process management & thread management strategies along with their different operations
CO3: Implement different system calls for various file handling operations.
CO4: Determine paging and Caching techniques related to Virtual Memory.
CO5: Ability to understand and analyze various disk scheduling and file system techniques

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H			M				L			L		H		L
CO2		M	L						M					M	
CO3			M		M									M	M
CO4	M		L									L			
CO5	M	M		H					L				M	M	

H = Highly Related; M = Medium L = Low

Text Books:

1. Operating Systems Concepts – Silberschatz, Galvin, Wiley Publications (2008)
2. Modern Operating Systems - Andrew S. Tanenbaum, Pearson Education Asia / PHI(2005)

Reference Books:

1. Operating Systems – William Stallings, Pearson Education Asia (2002)
2. UNIX System Programming Using C++, by Terrence Chan: Prentice Hall India, 1999.

Advanced Programming in UNIX Environment, by W. Richard Stevens: 2nd Ed, Pearson Education, 2005

BCO 005B	Data Structure and Algorithms Lab	0-0-2

Advance ist of Experiments

1.Write a program to implement following searching algorithms using array data structure
    1.1 Matrix Addition and Subtraction
    1.2 Matrix Multiplication and Transpose
2.Write a program to implement following searching algorithms using array data structure
    2.1. Linear Search
    2.2. Binary Search
3. Write a program to implement following searching algorithms using array data structure
    3.1. Insertion Sort
    3.2 Bubble Sort
4. Write a program to implement following searching algorithms using array data structure
    4.1. Selection Sort
    4.2 Quick Sort
5. Write a program to implement following operations on stack using array data structure.
    5.1 Traversing
    5.2 Push
    5.3 POP
6. Write a program to implement following examples of recursion
    6.1 Fibonacci Series
    6.2 Factorial Function
    6.3 Tower of Hanoi
7. Write a program to implement Merge Sort.
8. Write a program to implement following operations on Queue using array data structure.
    8.1 Insertion8.2 Deletion8.3 Traversing
9. Write a program to implement Postfix evaluation.
10. Write a program to implement Infix to Postfix Notation.
11. Write a program to implement following operations on Link List data structure.
    11.1 Insertion at beginning
    11.2 Insertion at last
    11.3 Insertion at any location
12. Write a program to implement following operations on Link List data structure.
    12.1 Deletion at beginning
    12.2 Deletion at last
    12.3 Deletion at any location
13. Write a program to implement Doubly Link List
    13.1 Insertion13.2 Traversing
14. Write a program to implement Breadth First Search Algorithm.
15. Write a program to implement Depth First Search Algorithm.

Course Outcomes:

CO1: Show the understanding of various data structure concepts like Stacks, Queues, Linked List, Trees and File

CO2: Understand the applications of data structures.

CO3: Understand with utilization of data structure techniques in problem solving.

CO4: Use comprehensive knowledge of data structures and algorithm.

CO5: Use asymptotic analysis of algorithm.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES

PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Spec Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	H												M		
CO2			H		M								M		
CO3		H							M			L		H	
CO4	H	M											L		
CO5		M		H											

H = Highly Related; M = Medium; L = Low

BCO 355A	**SUPERVISED LEARNING**	**3-1-0 [4]**

OBJECTIVE:

- Identify the machine learning types: Supervised, unsupervised and reinforcement learnings
- Explain the concepts associated with gradient descent, cost function, and loss function
- Understand various regression models using examples and Python coding
- Ensemble methods and models associated with it
- Describe classification techniques with use cases

UNIT 1	Machine learning,why we need machine learning, machine learning process State the different types of learning: Supervised,unsupervised and reinforcement learning,, Detailing out on labeled data and its types,classification and regression models, unlabeled data and its types,clustering model; Gradient Descent- Overview**,**Gradient Descent, Finding a Minimum Using Gradient Descent, Estimating the Gradient, Using the Gradient Descent, Example, Loss Function, Different Loss Functions
UNIT 2	Regression Technique, Origin of Regression, Regression in Real World, regression concepts, Regression Types, Linear Regression Types, Linear Regression Variance, Co-Variance, Linear Regression Correlation Coefficient, OLS, R Squared, Goodness of fit, Linear Regression Using Gradient Descent, Gradient Descent Explained with an Example, Stochastic Gradient Descent, Cost Function –Partial Derivative, Testing Model Using Cross Validation, Cross Validation Types, regularized regression, Ridge Regression, lasso regression, L1 vs L2 Norm – Regression, Generalized Linear Regression, RANDOM COMPONENT OF A GLM
UNIT 3	Classification Technique, Decision Tree, Decision Tree Illustration using Sample Dataset, concept of homogeneity., entropy, Entropy Explained with Rainfall Example, plot of entropy versus the proportionsm, Information Gain, Algorithms to Create a Decision Tree, Gini Index, Truncation and Pruning, Decision Tree Working Methodology, Decision Tree Tuning Parameters
UNIT 4	Naïve Bayes, bayes theorem., Example, Naïve Bayes Algorithm for Categorical Data, Popular Naive Bayes Classifiers, Types of Naive Bayes Classifier, Naïve Bayes for Text Classification, popular naive bayes classifiers, Naïve Bayes Algorithm, K Nearest Neighbour classification , Curse of Dimensionality, K-Factor, Implementation of KNN using Python
UNIT 5	Ensemble Methods ,Why Ensemble?, Example, Methods for Constructing Ensemble, advantages and disadvantages of ensembling. Random Forest, Random Forest Example, Random Forest Use Case, Random Forest Algorithm, Comparing other Models Accuracy, Bootstrapping and Bagging, Out of Bag Error, OOB Score Before Tuning, OOB and Hyper Parameter Tuning, Ensemble Model Using Majority Voting, Gradient Boosting, Weak Learner, Gradient Boosting Example, Moving towards XGBoost, Parameters of XGBoost

Course OUTCOME (CO):

CO1: Understand the basics of Machine Learning
CO2: Explore the regression techniques in Machine Learning
CO3: Understand the Decision Tress Application with illustrations.
CO4: Learn the Naive Bayes Classification Techniques
CO5: Learn the ensemble methods and methods of constructing ensemble.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Spec Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	P
CO1	M	M	M	L		L			L	L			M	H	M
CO2	M	H	H	H	H	L						L	M	H	H
CO3	M	H	H	H	H						L	L	M	H	H
CO4	M	H	H	H	H		L				L	L	M	H	H
CO5	M	M	M	M	H	L			L			L	M	H	H

H = Highly Related; M = Medium; L = Low

Text Books:

1. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido

Reference Books:

1. The Elements of Statistical Learning (Second Ed.) by Trevor Hastie, Robert Tibshirani, and Jeron Friedman
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.

BCO 356A	**SUPERVISED LEARNING in machine learning Lab**	**3-1-0 [4]**

Supervised Learning Lab List of Programs

1. Understanding the Learning Implementation on Jupyter Notebook
2. Using NumPy functions in Jupyter
3. Using Pandas in Jupyter
4. Using SciPy in Jupyter
5. Using Simple Linear Regression, calculate Gradient and Cost minimum, Along with line of best fit.
6. Understand Linear Regression and other regression techniques using house prices prediction data
7. Understanding Decision tree with sample dataset.
8. KNN algorithm explained with Cancer Data. (Using Python)
9. Identifying optimal K value in K-means Clustering algorithm. (Using Python)
10. Random Forest algorithm explained with classification and Regression (Using Python)
11. Implement Gradient Boosting Machine using Python.
12. Understand Logistic Regression model using Iris dataset (using Python)

Course OUTCOME (CO):

CO1: Understand the basics of Machine Learning
CO2: Explore the regression techniques in Machine Learning
CO3: Understand the Decision Tress Application with illustrations.
CO4: Learn the Naive Bayes Classification Techniques
CO5: Learn the ensemble methods and methods of constructing ensemble.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES
PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Speci Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	P
CO1	M	M	M	L		L			L	L			M	H	M
CO2	M	H	H	H	H	L						L	M	H	H
CO3	M	H	H	H	H						L	L	M	H	H
CO4	M	H	H	H	H		L				L	L	M	H	H
CO5	M	M	M	M	H	L			L			L	M	H	H

H = Highly Related; M = Medium; L = Low

Text Books:

2. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido

Reference Books:

3. The Elements of Statistical Learning (Second Ed.) by Trevor Hastie, Robert Tibshirani, and Jeron Friedman
4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.

BCO 014B	OPERATING SYSTEMS LAB	0-0-2 [2]

List of Experiments

Experiment No	Aim
1	Write a C program to implement the various process scheduling mechanisms such as FCFS scheduling.
2	Write a C program to implement the various process scheduling mechanisms such as SJF Scheduling.
3	Write a C program to implement the various process scheduling mechanisms such as Round Robin Scheduling.
4	Write a C program to implement the various process scheduling mechanisms such as Priority Scheduling.
5	To implement deadlock avoidance & Prevention by using Banker's Algorithm.
6	To implement page replacement algorithms FIFO (First In First Out).
7	To implement page replacement algorithm LRU (Least Recently Used).
8	To implement page replacement algorithms Optimal (The page which is not used for longest time)
9	To implement the memory management policy- Paging.
10	To implement the memory management policy-segmentation.
11	Write a C Program to implement Sequential File Allocation method.
12	Write a C Program to implement Indexed File Allocation method.
13	Write a C Program to implement Linked File Allocation method.
14	Write a program to implement multi program variable task (MVT).
15	Write a program to implement multi program fixed task (MFT).

Course Outcome (CO):

At the ends of this course studentswill have:

CO1: Classify Unix Kernel mode with user mode & contrast between Kernel structures.

CO2: Identify and estimate process management & thread management strategies along with their different operat

CO3:Implement different system calls for various file handling operations.

CO4: Determine paging and Caching techniques related to Virtual Memory.

CO5: construct shell scripts.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES
PROGRAM SPECIFIC OUTCOMES:

Course Outcome	**Program Outcome**												**Program Spec Outcome**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	P
CO1	H			M				L			L		H		L
CO2		M	L						M					M	
CO3			M		M									M	M
CO4	M		L									L			
CO5	M	M	L	M								L	H		

H = Highly Related; M = Medium L = Low

Contact Hours (L-T-P): 0-0-2

BCO594A	**Computer Networks Lab**	**Total Credits: 1**

List of Experiments

Students are required to perform any ten experiments out of the following list of experiments.

1	Using, linux-terminal or Windows-cmd, execute following networking commands and note the output: ping, traceroute, netstat, arp, ipconfig, Getmac, hostname, NSLookUp, pathping, SystemInfo
2	Using Packet Tracer, create a basic network of two computers using appropriate network wire. Use Static IP address allocation and show connectivity
3	Using Packet Tracer, create a basic network of One server and two computers using appropriate network wire. Use Dynamic IP address allocation and show connectivity
4	Using Packet Tracer, create a basic network of One server and two computers and two mobile / movable devices using appropriate network wire. Show connectivity
5	Using Packet Tracer, create a network with three routers with RIPv1 and each router associated network will have a minimum of three PCs. Show Connectivity
6	Using Packet Tracer, create a network with three routers with RIPv2 and each router associated network will have a minimum of three PCs. Show Connectivity
7	Using Packet Tracer, create a network with three routers with OSPF and each router associated network will have a minimum of three PCs. Show Connectivity
8	Using Packet Tracer, create a network with three routers with BGP and each router associated network will have a minimum of three PCs. Show Connectivity
9	Using Packet Tracer, create a wireless network of multiple PCs using appropriate access points.
10	Using Wireshark, network analyzer, set the filter for ICMP, TCP, HTTP, UDP, FTP and perform respective protocol transactions to show/prove that the network analyzer is working

Course Outcomes-

While graduating, students would be able to:

CO1. Execute and interpret basic network diagnostic and configuration commands using command-line interfaces (CLI).

CO2. Design and simulate a small-scale wired network using Packet Tracer with static IP addressing.

CO3. Design and simulate a client-server network using Dynamic Host Configuration Protocol (DHCP).

CO4. Implement and simulate hybrid networks including mobile or wireless devices.

CO5. Configure and simulate routing protocols (RIPv1, RIPv2, OSPF, BGP) in multi-router environments.

CO6. Design and simulate a wireless network with multiple PCs using access points.

CO7. Capture and analyze network traffic using Wireshark with protocol-level filtering and verification.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	*H*	*M*	-	*M*	*M*							*M*	*H*	*M*	
CO2	*H*	*M*	*H*	*M*	*H*							*M*	*H*	*M*	
CO3	*H*	*M*	*H*	*M*	*H*							*M*	*H*	*M*	
CO4	*H*	*M*	*H*	*M*	*H*							*M*	*H*	*H*	
CO5	*H*	*H*	*H*	*H*	*H*							*M*	*H*	*H*	
CO6	*H*	*M*	*H*	*M*	*H*							*M*	*H*	*H*	
CO7	*H*	*H*	-	*H*	*H*							*M*	*H*	*H*	

H = Highly Related; M = Medium L = Low

Contact Hours (L-T-P): 0-0-2

BCO610A	*Prompt Engineering for C and C++*	**Total Credits: 4**

Course Objective:

Lab Objective:

To equip students with hands-on experience in leveraging AI models through prompt engineering for writing, debugging, testing, optimizing, and understanding C and C++ programs.

List of Experiments

Module No.	Title	Lab Activities
1	Introduction to Prompt Engineering	Use prompts to generate basic C/C++ programs (Hello World, basic input/output)
2	Prompt Patterns	Experiment with different styles of prompts (descriptive, imperative, structured)
3	Prompting for Logic Building	Use prompts to generate logic for loops, conditions, and arrays in C
4	Prompt-based Code Generation	Generate and execute C programs for mathematical problems (e.g., factorial, Fibonacci)
5	Prompting for Modular Programming	Prompt for functions and parameterized code in C
6	Prompt Debugging – C Programs	Provide prompts to detect and fix logical and syntactical errors
7	Prompting for Data Structures in C	Generate code for structures, unions, and pointers using AI
8	Introduction to C++ Prompting	Generate simple class-based programs (constructors, methods, objects)
9	OOP Concepts through Prompts	Use prompts to implement inheritance, polymorphism, and encapsulation
10	Prompting for STL	Generate and modify programs using vectors, maps, and iterators
11	Code Optimization via Prompting	Prompt AI to refactor and optimize inefficient C/C++ code
12	Prompting for File Handling	Generate programs for reading/writing files in C and C++
13	AI-assisted Testing	Use prompts to generate test cases and check edge conditions
14	Prompt-driven Project Planning	Prompt AI to help with design, logic, and documentation of a mini project
15	Final Project & Ethical Considerations	Build a small AI-supported C/C++ project with documentation and reflection on ethical use

Course Outcomes (COs)

CO No.	Course Outcome
CO1	Understand the fundamentals of prompt engineering and its relevance to C/C++
CO2	Design effective prompts to generate, debug, and refactor C programs
CO3	Apply prompting techniques to automate OOP and STL-based C++ development
CO4	Evaluate and optimize C/C++ code with the help of AI-assisted tools
CO5	Demonstrate prompt-driven project development and ethical use of AI in coding

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	*H*		*M*	*M*					*L*	*M*		*H*	*MM*		
CO2				*M*				*L*							*H*
CO3							*L*								*H*
CO4															
CO5	*H*		*M*			*M*									*H*

H = Highly Related; M = Medium L = Low

BCO009B	COMPUTER ORGANIZATION AND DESIGN	3-1-0 [4]

OJECTIVE:

- To understand the number system conversions and logic gates.
- To study the design of logic unit and bus memory transfer.
- To study the addressing modes and instruction set architecture, register transfer RISC/CISC
- To study the hierarchical memory system including cache memories and its address mapping.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT 1	Introduction to number system, methods of base conversions; Binary, octal and hexadecimal arithmetic; Basic organization of computers; logic gates, Information representation, Fixed-Point Arithmetic: Floating point representation (Single &double precision), Complements.
UNIT 2	Using Karnaugh map methods, SOP, POS simplification, Logic design: Half adder, full adder, Adder–Subtractor. Multiplexer/ de-multiplexer, decoders. Fetch, decode and execute cycle. RTL, Bus & Memory Transfer, Tri state Buffer.
UNIT 3	Instruction set architectures, addressing modes, instruction cycles, Differentiate RISC versus CISC architectures. Arithmetic Micro-operation: Addition, Subtraction, Multiplication (Booth's Algorithm),Array Multiplier
UNIT 4	Memory Technology, static and dynamic memory, Random Access and Serial Access Memories, Cache memory and Memory Hierarchy, Address Mapping, Cache updation schemes,
UNIT 5	I/O subsystems: Interfacing with IO devices, keyboard and display interfaces; Basic concepts Bus Control, Read Write operations, Programmed IO, Concept of handshaking, Polled and Interrupt-driven I/O, DMA data transfer.

Course Outcome (CO):

At the ends of this course studentswill have:

CO1: Awareness of computer organization.
CO2: Design and architecture of machine.
CO3:Implement different system calls for various units.
CO4: Logical representation of storage, representation and management.
CO5: Analysis of I/O subsystem.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	**Program Outcome**												**Program Specific Outcome**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H											M	H		
CO2			H		M									M	
CO3				M					M				L		
CO4				H						M			M		L
CO5				H						M					L

H = Highly Related; M = Medium L = Low

Text Book:

1. Digital Design, M.Morris Mano, Pearson
2. Computer System Architecture by Mano, Pearson

Reference books:

1. Modern Digital Electronics, R.P. Jain, TMH
2. Computer Organization by V. Carl Hamacher, Safwat G. Zaky and Zvonko G. Vranesic , McGraw-Hill series(2002)
3. Digital Fundamental, Floyd & Jain, Pearson.
4. Computer Architecture and Organization, by Hayes, J.P.1998, McGraw-Hill
5. Digital Logic And Computer Design, Mano, Pearson

.BCO010C	DATABASE MANAGEMENT SYSTEMS	3-1-0 [4]

OJECTIVE:

- To provide knowledge of relational model
- To learn about ER diagrams.
- To learn about Query Processing and Transaction Processing

UNIT 1	Introduction - Database Systems versus File Systems, View of Data, Data Models, database languages, Database Users and Administrators. Transaction Management, Components of a Database management System. Entity-Relationship Model – Basic Concepts, Constraints, Keys, Design Issues, E-R Diagrams.
UNIT 2	Relational Database Design- Functional Dependencies, Multi-valued Dependencies, Normal Forms, Decomposition into Normalized Relations.
UNIT 3	Relational Model- Structures of relational databases, Integrity Constraints, Logical database Design, Tables, Views, Data Dictionary. Relational Algebra, Relational Calculus. SQL – Basic Structures, Query Handling,Triggers,Nested SQL Query, Embedded SQL,
UNIT 4	Fundamental Concepts of Transaction Management, ACID property. Serializability and testing for serializability, concurrency control schemes, lock-based protocols, two-phase locking protocols, graph-based protocols, time stamp-based protocols, deadlocks.
UNIT 5	File System: File organization- Heap File, Sequential File, Hash File, Clustered file, file operations, indexing, B-tree, B+ tree, Introduction to Data Mining, Data Farming, Data Warehousing

Course Outcome (CO):

At the ends of this course studentswill have:

CO1: Awareness of database management basics and different models that we use for database.
CO2: Design and architecture of relational model, relational algebra and SQL queries.
CO3: Implement different form of normalization.
CO4: Logical representation of internet database.
CO5: Analysis and concepts of transaction, concurrency and recovery systems.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H												H	M	
CO2			H		M				M						L
CO3				H		M							M		
CO4				M								M		L	L
CO5	M	L		H					L				M		

H = Highly Related; M = Medium L = Low

Text Books:

1. Database Systems Concepts – Korthe, TMH
2. An Introduction to Database Design – Date

Reference Books:

1. Fundamentals of Database Systems – Elmasri and Navathe
2. Database Management and Design – Hansen and Hansen .
3. Object-Oriented Database Design – Harrington

BCO 357A	**UNSUPERVISED LEARNING**	**3-1-0 [4]**

OBJECTIVE:

- Explain about the Dimensionality reduction.
- Understand Clustering
- Define types of Neural Networks
- Introduce Convolution Neural Networks
- Learn to build a Convolution Neural Networks from scratch.

UNIT 1	Introduction, Singular Value Decomposition, SVD code:, Principal Component Analysis (PCA), Isometric Maps (Isomaps), Multidimensional Scaling (MDS), ISOMAPS with MDS, ISOMAPS (Code), Visualizing the ISOMAPS Data, Applying PCA on the Same Data, Visualization of PCA, Feature Selection Techniques, Wrapper Method
UNIT 2	What is Clustering and Why is it Important?, Techniques in Clustering, K-Means Clustering, Steps for K-Means Algorithms, Density Based Spatial Clustering (DBSCAN), Types of Points in DBSCAN, DBSCAN Example, DBSCAN: Advantages, DBSCAN: Disadvantages, Hierarchical Clustering, Dendrograms, Hierarchical Clustering Code, DBSCAN Dendrogram Visualization
UNIT 3	Introduction to Neural Networks, Types of Neural Networks, Perceptron, Limitations of Perceptron, Activation Functions, Types of Activation Functions, Linear Activation Function, Non- Linear Data, Non-Linear Activation Function (Sigmoid), Non- Linear Activation Function (TanH), Non-Linear Activation Function (ReLu), Non-Linear Activation Function (Leaky ReLu), Derivative of Activation FunctionsNeural Networks, Feed Forward Network, ANN Forward Propagation, Flow of Data in ANN, Backpropagation, Cost Function in Backpropagation, ANN Evaluation, Complete Flow of Data in Neural Network, ANN Training ANN Design, Dropout in Neural Networks
UNIT 4	Understanding Images, Need of Convolution Neural Network Convolution, Neural Network Working, Working of CNN with Kernel, Understanding Convolution Mathematically, An Example of CNN, Convolution of Images, Convolution Neurons Visualization, Parameters for Feature Maps, Activation Function in Convolution Neural Network, Pooling Step, Advantages of Pooling, Batch Normalization, Typical Convolution Neural Network, Training CNN using Backpropagation, Steps for CNN Backpropagation, Example of Convolution Neural Network Architecture, Visualization of Convolutional Neural Networks,
UNIT 5	Using MLP instead of RNN, Recurrent Neural Network (RNN), Steps in Recurrent Neuron, RNN Mathematically, Example of Forward Propagation for RNN, Back Propagation in Recurrent Neural Network, Steps for Back Propagation, Applications of RNN, Limitations of RNN, LSTM Conveyor Belt Analogy, Architecture of LSTM, Gates in LSTM, Forget Gate, Input Gate, Output Gate

Course OUTCOME (CO):

CO1: Understand the basics of dimensionality reduction.
CO2: Explore the importance of clustering.
CO3: Understand the essentials of Neural Networks
CO4: Understand the images and basics of convolutional neural networks.
CO5: Introduce Recurrent Neural Networks

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	M	M	M	L		L			L	L			M	H	M
CO2	M	H	H	H	H	L						L	M	H	H
CO3	M	H	H	H	H						L	L	M	H	H
CO4	M	H	H	H	H		L				L	L	M	H	H
CO5	M	M	M	M	H	L			L			L	M	H	H

H = Highly Related; M = Medium; L = Low

Text Books:

1. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido

Reference Books:

2. The Elements of Statistical Learning (Second Ed.) by Trevor Hastie, Robert Tibshirani, and Jerome Friedman
3. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009

BCO 358A	**UNSUPERVISED LEARNING Lab**	**3-1-0 [4]**

Unsupervised Learning & Neural Networks Lab
List of Programs

1. Write a program for using PCA on MNIST Dataset.
2. Write a program for using PCA on Cat and Dog Dataset.
3. Write a program for using LDA on Cat and Dog Dataset.
4. Write a program for using DBSCAN on IRIS Dataset.
5. Write a program for using SVD on MNIST Digits Dataset.
6. Write a program for Feature Selection Techniques (Forward/ Backward).
7. Write a program for K-Means Clustering on IRIS Dataset.
8. Write a program for Hierarchical Clustering on Customers Dataset.
9. Write a program for Neural Networks on Mobile Price Classification.
10. Write a program for Convolution Neural Network on MNIST Dataset.
11. Write a program for Convolution Neural Network on Malaria Dataset.
12. Write a program for Convolution Neural Network on Aerial Cactus Dataset.

Course OUTCOME (CO):

CO1: Understand the basics of dimensionality reduction.
CO2: Explore the importance of clustering.
CO3: Understand the essentials of Neural Networks
CO4: Understand the images and basics of convolutional neural networks.
CO5: Introduce Recurrent Neural Networks

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	M	M	M	L		L			L	L			M	H	M
CO2	M	H	H	H	H	L						L	M	H	H
CO3	M	H	H	H	H						L	L	M	H	H
CO4	M	H	H	H	H		L				L	L	M	H	H
CO5	M	M	M	M	H	L			L			L	M	H	H

H = Highly Related; M = Medium; L = Low

Text Books:

1. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido

Reference Books:

2. The Elements of Statistical Learning (Second Ed.) by Trevor Hastie, Robert Tibshirani, and Jerome Friedman
3. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.

Contact Hours (L-T-P): 0-0-2

BCO611A	**Google cloud computing foundation LAB**	**Total Credits: 1**

List of Experiments

Students are required to perform any ten experiments out of the following list of experiments.

1	**Module 1: Google Cloud Computing Foundations: Cloud Computing Fundamentals** A Tour of Google Cloud Hands-on Labs Getting Started with Cloud Shell and gcloud
2	**Module 2: Google Cloud to build your application** Create a Virtual Machine, App Engine: Qwik Start - Python Cloud Run Functions: Qwik Start - Command Line Google Kubernetes Engine: Qwik Start
3	**Module 3: Google Cloud Computing Foundations: Infrastructure in Google Cloud** Cloud Storage: Qwik Start - CLI/SDK Cloud SQL for MySQL: Qwik Start Pub/Sub: Qwik Start - Python User Authentication: Identity-Aware Proxy Cloud IAM: Qwik Start
4	**Module 4: Google Cloud Computing Foundations: Networking & Security in Google Cloud** Multiple VPC Networks VPC Networks - Controlling Access Application Load Balancer with Cloud Armor Cloud Monitoring: Qwik Start
5	**Module 5: Google Cloud Computing Foundations: Data, ML, and AI in Google Cloud** Dataproc: Qwik Start - Console Dataproc: Qwik Start - Command Line Dataflow: Qwik Start - Templates Dataflow: Qwik Start - Python Dataprep: Qwik Start
6	**Module 6: Machine learning- Explain what machine learning is, the terminology used, and its value proposition** Cloud Natural Language API: Qwik Start Speech-to-Text API: Qwik Start Video Intelligence: Qwik Start
7	**Module 7: Implement Load Balancing on Compute Engine** Set Up Network and Application Load Balancers Implement Load Balancing on Compute Engine: Challenge Lab

8	**Module 8: Perform Foundational Infrastructure Tasks in Google Cloud** Cloud IAM: Qwik Start Cloud Storage: Qwik Start - Cloud Console Cloud Monitoring: Qwik Start Cloud Run Functions: Qwik Start - Console Set Up an App Dev Environment on Google Cloud: Challenge Lab
9	**Module 9: Build a Secure Google Cloud Network** Securing Virtual Machines using Chrome Enterprise Premium Multiple VPC Networks VPC Networks - Controlling Access
10	**Module 10**: **Cloud infrastructure** Application Load Balancer with Cloud Armor Create an Internal Load Balancer Build a Secure Google Cloud Network: Challenge Lab
11	**Module 11: Prepare Data for ML APIs on Google Cloud** Cloud Natural Language API: Qwik Start Speech-to-Text API: Qwik Start Video Intelligence: Qwik Start Prepare Data for ML APIs on Google Cloud: Challenge Lab

Course Outcomes-

While graduating, students of GCCF program would be able to:

CO1: Understand Core Concepts and Tools of Google Cloud Platform (GCP)

CO2: Deploy and Manage Applications Using GCP Services

CO3: Work with GCP Infrastructure and Data Services

CO4 Implement Cloud Networking, Security, and Monitoring

CO5: Explore Machine Learning and AI Capabilities in GCP.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

›urse Outcom	Program OutComes												›gram Specific ıtcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	O 9	PO1 0	O 11	O 12	S O1	S O2	S O3
CO1		M							M		H		M	H	
CO2	L		M		H		L	L		M		M		H	M
CO3		M		H	M	L		L			H		M	H	
CO4	L		H	M			L	M	M		H		M	H	
CO5															

H = Highly Related; M = Medium; L = Low

Contact Hours (L-T-P): 0-0-2

BCO613A	Salesforce Administrator LAB	Total Credits: 1

List of Experiments

S. No.	Title of Lab Exercise
1	To create and manage Salesforce Trailhead Playground and explore Salesforce Lightning Interface.
2	To create custom objects, fields, and relationships using the data modeling features in Salesforce.
3	To import data using Data Import Wizard and validate data using Validation Rules.
4	To create users, assign roles and profiles, and configure permission sets.
5	To configure organization-wide settings including business hours and company information.
6	To set up organization-wide defaults, role hierarchy, and sharing rules to manage access control.
7	To automate business processes using Workflow Rules and Email Alerts.
8	To automate record updates using Process Builder.
9	To build record-triggered flows for automating data handling and logic.
10	To create custom reports and dashboards for visualizing business data.
11	To customize page layouts and record types, and build apps using Lightning App Builder.
12	To deploy changes using Change Sets in sandbox and production environments.
13	To create single-step approval process for record approval.
14	To implement a mini capstone project such as Student Record Manager, Lead Tracker, or Leave Approval System.

Course Outcomes

While graduating, students of the Salesforce Administrator Lab program would be able to:

CO1: Understand and apply core Salesforce administrative features like object creation, user management, and access control.
CO2: Implement automation tools like Workflow, Process Builder, and Flows in business scenarios.
CO3: Perform data operations, reports, dashboards, and app customization using Salesforce platform.
CO4: Work collaboratively on small Salesforce projects and communicate results effectively.
CO5: Demonstrate the ability to configure and deploy Salesforce changes across environments using sandboxes and change sets.

Mapping Course Outcomes Leading to the Achievement of Program Outcomes and Program Specific Outcomes:

urse Outcom	Program OutComes												ogram Specific tcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	O 9	PO1 0	O 11	O 12	S O1	S O2	S O3
CO1	H	M	H	L							L		H		
CO2	M	H	H	M		L							M	M	
CO3	H	M	H	L							M		H	H	
CO4			L		H				M	H			M	M	
CO5	H	M	H	M	M								M	H	

BCO 013A	DATABASE MANAGEMENT SYSTEMS LAB	0-0-2 [2]

List of Experiments

1	Installation of MySQL
2	Analyze the problem and come with the entities in it. Identify what Data has to be persisted in the databases.
3	Represent all entities in a tabular fashion. Represent all relationships in a tabular fashion.
4	Creating of Tables on given problem
5	Applying Not Null, Check, Unique Constraints on database Tables.
6	Applying Primary Key, References, Foreign Key Constraints on database Tables.
7	Applying Insert, Select, Distinct Clause, Where Clause on database Tables.
8	Applying Update, Delete, Drop, on database Tables.
9	Applying table creation with select, Insert data using select, Renaming on database Tables.
10	Practice Queries using MINUS, UNION, INTERSECT, % operator.
11	Practice Queries using Group Functions.
12	Practice Queries using Group By, Having, Order By Functions.
13	Practice Queries using Arithmetic Operators, Comparison Operator.
14	Practice Queries using Logical Operator.
15	Practice Queries using any four String Functions.
16	Practice Queries using any four String Functions.
17	Practice Queries using Numeric Functions.
18	Practice Queries using Date Functions.

Course Outcome (CO):

At the ends of this course studentswill have:

CO1: Awareness of database management basics and different models that we use for database.
CO2: Design and architecture of relational model, relational algebra and SQL queries.
CO3: Implement different form of normalization.
CO4: Logical representation of internet database.
CO5: Analysis and concepts of transaction, concurrency and recovery systems.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H												H	M	
CO2			H		M				M						L
CO3				H		M							M		
CO4				M								M		L	L
CO5	M	L		H					L				M		

H = Highly Related; M = Medium L = Low

BCO612A	**Competitive Coding using AI (DSA)**	**Total Credits: 2**

List of Experiments

Students are required to perform any ten experiments out of the following list of experiments.

1	Write the shortest codes that you can think of for the following tasks: I. Given a string that represents a base X number, convert it to equivalent string in base Y, 2 ≤ X, Y ≤ 36. For example: "FF" in base X = 16 (Hexadecimal) is "255" in base Y1 = 10 (Decimal) and "11111111" in base Y2 = 2 (binary). (More details in Section 5.3.2). II. Given a list of integers L of size up to 1M items, determine whether a value v exists in L by not using more than 20 comparisons? (More details in Section 2.2.1). III. Given a date, determine what is the day (Monday, Tuesday, . . ., Sunday) of that date? (e.g., 9 August 2010 – the launch date of the first edition of this book – is Monday). IV. Given a string, replace all 'special words' of length 3 with 3 stars "***". The 'special word' starts with a lowercase alphabet character and followed by two consecutive digits, e.g. S = "line: a70 and z72 will be replaced, but aa24 and a872 will not" will be transformed to S = "line: *** and *** will be replaced, but aa24 and a872 will not".
2	Write the shortest possible code to read in a double (e.g. 1.4732, 15.324547327, etc) and print it again, but now with minimum field width 7 and 3 digits after decimal point (e.g. ss1.473 (where 's' denotes a space), s15.325, etc).
3	Generate all possible permutations of {0, 1, 2, . . ., N-1}, for N = 10.
4	Generate all possible subsets of {0, 1, 2, . . ., N-1}, for N = 20.
5	Implement an algorithm that computes the length of the Longest Common Subsequence (LCS) between two given strings.
6	Design and implement a program that generates and displays all prime numbers within a specified range.
7	Develop a program that counts the number of words in a given line of text, where a word is defined as a sequence of alphabetic characters (A–Z, a–z).
8	Implement a program that repeatedly sums the digits of a given integer until a single-digit result (known as the digital root) is obtained.
9	Develop a program that checks whether a given square matrix is symmetric about its main diagonal and contains only non-negative elements.
10	Write a program that simulates the process of generating anagrams of a word using a stack-based operation model.

11	Given a graph represented by an Adjacency Matrix, transpose it (reverse the direction of each edge). How to do the same with Adjacency List?
12	Determine whether a given sequence of non-negative integers can represent the degree sequence of a simple undirected graph.
13	Write a code that takes in a Directed Graph and then convert it into a Directed Acyclic Graph (DAG).
14	To simulate the logic behind the classic game Minesweeper by writing a program that processes a minefield grid and calculates the number of adjacent mines for each empty cell.
15	Write a program to implement Tic-Tac-Toe game.

Course Outcomes-

Upon completion of the course, students will be able to:

CO1 Apply the basic, sorting and searching techniques, to solve the problem components etc.
CO2 Analyze the concepts of path finding algorithms for flows and cuts, strings and greedy algorithms
CO3 Evaluate the AI models pre-processed through various feature engineering algorithms.
CO4 Develop the code for the recommender system using Natural Language processing.
CO5 Design various reinforcement algorithms to solve real-time complex problems.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	*H*		*M*	*M*					*L*	*M*		*H*	*M*		
CO2				*M*				*L*							*H*
CO3							*L*								*H*
CO4															
CO5	*H*		*M*			*M*									*H*

H = Highly Related; M = Medium L = Low

BCO017B	FORMAL LANGUAGES & AUTOMATION THEORY	3-1-0 [4]

Objective:

- To understand various Computing models like Finite State Machine, Pushdown Automata, and Turing Machine.
- To understand Decidability and Undesirability of various problems
- To construct pushdown automata and the equivalent context free grammars.
- To prove the equivalence of languages described by pushdown automata and context free grammars.
- To construct Turing machines and Post machines and prove the equivalence of languages described by Turing machines and Post machines.

UNIT 1	**FINITE AUTOMATA (FA):** Introduction, Deterministic Finite Automata (DFA) - Formal definition, simpler notations (state transition diagram, transition table), language of a DFA. Nondeterministic Finite Automata (NFA)- Definition of NFA, language of an NFA, Equivalence of Deterministic and Nondeterministic Finite Automata, Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Designing of Finite Automata, Minimization of Deterministic Finde Automata, Finite automata with output (Moore and Mealy machines) and Inter conversion.
UNIT 2	**REGULAR EXPRESSIONS (RE):** Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions. **REGULAR GRAMMARS:** Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA. Proving languages to be non-regular-Pumping lemma applications, Closure properties of regular languages.
UNIT 3	**CONTEXT FREE GRAMMER (CFG):** Derivation Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings. Ambiguity in CFG's, Minimization of CFG's, CNF, GNF, Pumping Lemma for CFL's, Enumeration of Properties of CFL (Proof's omitted).
UNIT 4	**PUSHDOWN AUTOMATA:** Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA **TURING MACHINES (TM):** Formal definition and behaviour, Languages of a TM, TM as accepters, and TM as a computer of integer functions, Types of TMs.
UNIT 5	**RECURSIVE AND RECURSIVELY ENUMERABLE LANGUAGES (REL):** Properties of recursive and recursively enumerable languages, Universal Turning machine, The Halting problem. Undecidable problems about TMs. Context sensitive language and linear bounded automata (LBA), Chomsky hierarchy, Decidability, Post's correspondence problem (PCP), undecidability of PCP.

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

CO1:Understand and construct finite state machines and the equivalent regular expressions.
CO2:Prove the equivalence of languages described by finite state machines and regular expressions.
CO3:Construct pushdown automata and the equivalent context free grammars.
CO4:Prove the equivalence of languages described by pushdown automata and context free grammars.
CO5:Construct Turing machines and Post machines and prove the equivalence of languages described by Turing machines and Post machines

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H		L										H		
CO2		H											L		
CO3	H		H												M
CO4		H		M											
CO5	H											H		L	

H = Highly Related; M = Medium L = Low

Text Books:

1.Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory,Languages and Computations", Second Edition, Pearson Education, 2008.

Reference Book:

1. Mishra K L P and Chandrasekaran N, "Theory of Computer Science – Automata, Languages and Computation", Third Edition, Prentice Hall of India, 2004.
2. Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation", Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2003.
3. Peter Linz, "An Introduction to Formal Language and Automata", Third Edition, Narosa Publishers, New Delhi, 2002.
4. Kamala Krithivasan and Rama. R, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education 2009.
5. John C Martin, "Introduction to Languages and the Theory of Computation", Third Edition, Tata McGraw Hill Publishing Company, New Delhi, 2007.

BCO023B	DESIGN AND ANALYSIS OF ALGORITHMS	3-0-0 [3]

OBJECTIVES:

At the end of the course, the student should be able to:

- Design effective, efficient, elegant, and readable algorithms for various classes of computing problems
- Determine space and time complexity of algorithms by the use various algorithm design techniques like (divide and conquer, backtracking, greedy, etc.)

UNIT 1	Introduction, Review of algorithms specification, time and space complexity, performance analysis, recurrence relations. Divide and Conquer – Binary Search, Quick Sort, And-Or Graphs
UNIT 2	Dynamic Programming: 0/1 Knapsack problem, Longest common subsequence, matrix chain multiplication. Greedy Algorithms: Fractional Knapsack Problem, Job sequencing, Optimal Merge patterns and Minimal Spanning trees. Backtrack: 4-queen problem, Branch and Bound: assignment problem
UNIT 3	Graph algorithms–Maximum flow problem, String Matching Algorithms: Naive algorithm, automata and KMP matcher algorithms, Boyer-Moore algorithm
UNIT 4	Number Theory Problems – CRT, GCD algorithms, modular arithmetic; Approximate Algorithms – Set cover, vertex cover, .Randomized Algorithms – Las Vegas and Monte Carlo methods
UNIT 5	NP Completeness: Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems.

OUTCOMES: After study of this subject student will be able to know

CO1: Various methods of calculating complexity

CO 2: Finding out thebestmethod for different algorithms

CO3: About computational geometry, like Lower bound theory, modular arithmetic and CRT

CO4: Various Decision Problems like NP Complete, NP hard

CO5: Knowledge of Graph and its algorithm

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	H	M		M			M				L	H	M	
CO2	H	H			H							L	H	M	M
CO3	M	H	L		M			M				M			M
CO4	H	L	M		M							L	M	H	
CO5	H	M	M		M			L				L	M	M	L

Textbooks:

1. Cormen, Leizerson&Rivest, Introduction to algorithms, Prentice-Hall. 2002
2. Horowitz &Sahni, Fundamentals of Computer Algorithms, Galgotia Publication. 1999

Reference Books:

1. Aho, HopCroft, Ullman, The Design and Analysis of Computer Algorithms, Addison-Wesley. 2001.
2. Introduction to Design and Analysis of Algorithms, Anny Levitin, Person Education Press. 2007.
3. Gilles Brassard & Paul Bratley, Fundamental Algorithms, Prentice-Hall. 1998

BCO 359A	ADVANCED NEURAL NETWORKS AND DEEP LEARNING	3-1-0 [4]

OBJECTIVE:

- Explain about Recurrent Neural Network.
- Creating a Deep Learning Network using Tensorflow.
- Understand Boltzmann Machines.
- Introduction to Deep Belief Networks
- Implement Modern statistical concepts.

UNIT 1	Gradient Descents, Gradient Descent Terminologies, Types of Gradient Descents, Recurrent Neural Network, Using MLP instead of RNN, Stepsin Recurrent Neuron, RNN Mathematically, Example of Feedforward Propagation, Backpropagation, Steps in Back Propagation, Limitations of RNN, Long Short Term Memory(LSTM), Architecture of LSTM, Gates in LSTM, Forget Gate, Input Gate, Output Gate, Predicting the next character using RNNs, Hopifield Network, Gated Recurrent Unit (GRU), GRU Reset Gate, Bidirectional RNN
UNIT 2	Introduction to Deep Learning, Deep Learning Subset of AI and ML, Machine Learning vs Deep Learning, Deep Learning Network Structure, Types of Deep Learning Networks, Convolution Neural Network (Convo Net), Tensor, Introduction to TensorFlow, advantages of TensorFlow, Deep Learning Libraries, Creating a Deep Learning Network using TensorFlow
UNIT 3	Introduction to Boltzmann Machines, Working of Boltzmann Network, Restricted Boltzmann Machines, Working, Deep Boltzmann Machine (DBM), DBM Training, Collaborative Filtering using Boltzmann Machines, Collaborative Filtering Using RBM, RBM Net Architecture, Markov Random Fields, Deep Boltzmann Machine
UNIT 4	Introduction to Deep Belief Network, Stacking RBM to create Deep Belief Network, Working of DBN, Greedy Layer Wise Learning, Need of Fine Tuning, Wake Sleep Algorithm
UNIT 5	Model Free Confidence Intervals, Confidence Interval Data Requirements, construct confidence interval, Jackknife Regression, Hidden Decision Trees, learn about confidence intervals, define jackknife regression, Probabilistic Graphical Models (PGM), Bayesian Network (BN), Inference in Bayesian Network, Explain graphical models, Describe tetter goodness of fi t and yield metrics

Course OUTCOME (CO):

CO1: Understand the concepts of feedforward propagation and backpropagation.
CO2: Explore the facets of deep learning.
CO3: Understand the working of Boltzmann machines.
CO4: Introduce Deep Belief networks.
CO5: Understand modern statistical concepts.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M	M	L		L			L	L			M	H	M
CO2	M	H	H	H	H	L						L	M	H	H
CO3	M	H	H	H	H						L	L	M	H	H
CO4	M	H	H	H	H		L				L	L	M	H	H
CO5	M	M	M	M	H	L			L			L	M	H	H

H = Highly Related; M = Medium; L = Low

Text Books:

1. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido

Reference Books:

2. The Elements of Statistical Learning (Second Ed.) by Trevor Hastie, Robert Tibshirani, and Jerome Friedman
3. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
4. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville "Deep learning." An MIT Press book in preparation. (2015)

BCO 360A	**ADVANCED NEURAL NETWORKS AND DEEP LEARNING Lab**	**3-1-0 [4]**

Advanced Neural Networks Lab
List of Programs

1. Build a perceptron model from Scratch
2. Write a program to visualize different activation functions and their derivative
3. Write a program for Hyperparameter Tuning and Optimization in Tensorflow
4. Write a program for simulation of Jackknife estimation of mean and median
5. Write a program for understanding different tensorflow syntax and different operations.
6. Write a program to understand Keras in Tensorflow
7. Write a program for Linear Regression in Tensorflow
8. Write a program for Logistic Regression with Tensorflow
9. Write a program for Next character prediction using RNN in Tensorflow
10. Write a program for next character prediction using Bidirectional RNN in ensorflow
11. Write a program for next word prediction using RNN in Tensorflow
12. Write a program for Collaborative Filtering using RBM in Tensorflow
13. Write a program for Classification using DBN
14. Write a program for A/B Testing using Bayesian Method in Tensorflow

Course OUTCOME (CO):

CO1: Understand the concepts of feedforward propagation and backpropagation.
CO2: Explore the facets of deep learning.
CO3: Understand the working of Boltzmann machines.
CO4: Introduce Deep Belief networks.
CO5: Understand modern statistical concepts.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	M	M	M	L		L			L	L			M	H	M
CO2	M	H	H	H	H	L						L	M	H	H
CO3	M	H	H	H	H						L	L	M	H	H
CO4	M	H	H	H	H		L				L	L	M	H	H
CO5	M	M	M	M	H	L			L			L	M	H	H

H = Highly Related; M = Medium; L = Low

Text Books:

1. Introduction to Machine Learning with Python by Andreas C. Müller, Sarah Guido

Reference Books:

2. The Elements of Statistical Learning (Second Ed.) by Trevor Hastie, Robert Tibshirani, and Jerome Friedman
3. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
4. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville "Deep learning." An MIT Press book in preparation. (2015)

BCO 025A	DESIGN& ANALYSIS OF ALGORITHMS LAB	0-0-2

List of Experiments

1. Write a Program to Explore a Binary Heap
2. Write a Program for Merging of two search trees
3. Write a program to implement Huffman tree construction
4. Write a Program for Computing a spanning tree having smallest value of largest edge
5. Write a Program for Finding the decimal dominant in linear time
6. Write a Program for Problems on Graphs. Etc.
7. Write a program to find Greatest Common Divisor
8. Write a program for fractional Knapsack problem
9. rite a program for 0/1 Knapsack problem
10. Write a program to implement Naive algorithm,
11. Write a program to implement KMP matcher algorithms,
12. Write a program to implement Boyer-Moore algorithm
13. Write a program to implement modular arithmetic
14. Write a program to implement Set cover,
15. Write a program to implement vertex cover

OUTCOMES: After study of this subject student will be able to know
CO1: Various methods of calculating complexity
CO 2: Finding out the best method for different algorithms
CO3: About computational geometry, like Lower bound theory, modular arithmetic and CRT
CO4: Various Decision Problems like NP Complete, NP hard
CO5: Knowledge of Graph and its algorithm

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	H	M		M			M				L	H	M	
CO2	H	H			H							L	H	M	M
CO3	M	H	L		M			M				M			M
CO4	H	L	M		M							L	M	H	
CO5	H	M	M		M			L				L	M	M	L

BCO 028B	COMPILER CONSTRUCTION	3-1-0 [4]

OBJECTIVE: At the end of the course, the student should be able to:

- Apply the principles in the theory of computation to the various stages in the design of compilers;
- Explain the stages involved in the translation process;
- Analyse problems related to the stages in the translation process;
- Design a compiler for a simple programming language; and
- Implement a compiler based on its design.

UNIT 1	Overview of compilation- The structure of a compiler and applications of compiler technology; Lexical analysis - The role of a lexical analyzer, specification of tokens, recognition of tokens, hand-written lexical analyzers, LEX, examples of LEX programs. Introduction to syntax analysis -Role of a parser, use of context-free grammars (CFG) in the specification of the syntax of programming languages, techniques for writing grammars for programming languages (removal left recursion, etc.), non- context-free constructs in programming languages, parse trees and ambiguity, examples of programming language grammars.
UNIT 2	Top-down parsing- FIRST & FOLLOW sets, LL(1) conditions, predictive parsing, recursive descent parsing, error recovery. LR-parsing - Handle pruning, shift-reduce parsing, viable prefixes, valid items, LR(0) automaton, LR-parsing algorithm, SLR(1), LR(1), and LALR(1) parsing. YACC, error recovery with YACC and examples of YACC specifications.
UNIT 3	Syntax-directed definitions (attribute grammars)-Synthesized and inherited attributes, examples of SDDs, evaluation orders for attributes of an SDD, Dependency graphs-attributed and L-attributed SDDs and their implementation using LR-parsers and Recursive Descent parsers respectively.
UNIT 4	Semantic analysis- Symbol tables and their data structures. Representation of "scope". Semantic analysis of expressions, assignment, and control-flow statements, declarations of variables and functions, function calls, etc., using S- and L-attributed SDDs (treatment of arrays and structures included). Semantic error recovery.
UNIT 5	Intermediate code generation - Different intermediate representations –quadruples, triples, trees, flow graphs, SSA forms, and their uses. Translation of expressions (including array references with subscripts) and assignment statements. Translation of control-flow statements – it- then-else, while-do, and switch. Short-circuit code and control-flow translation of Boolean expressions. Back patching. Examples to illustrate intermediate code generation for all constructs. Run-time environments: - Stack allocation of space and activation records. Access to non-local data on the stack in the case of procedures with and without nesting of procedures.

Course Outcome

At the end of this course students will have:

CO1 To apply the knowledge of lex tool &yacc tool to devleop a scanner & parser.
CO2 To design parser and Intermediate Code Generation in compiler.
CO3 To deal with different translators.

CO4 To learn the new code optimization techniques to improve the performance of a program in terms of speed & space.
CO5 To use the knowledge of patterns, tokens & regular expressions for solving a problem.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	**Program Outcome**												**Program Specific Outcome**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	H	L		H			L					H	M	
CO2		H				L							H		
CO3		L		H	L										M
CO4		H					H							H	
CO5		H		L		H									L

H = Highly Related; M = Medium L = Low

Text Books:

1. Compilers: Principles, Techniques, and Tools, by A.V. Aho, Monica Lam, Ravi Sethi, and J.D. Ullman, (2nd ed.), Addison-Wesley, 2007 (main text book, referred to as ALSU in lab assignments).
2. K.D. Cooper, and Linda Torczon, Engineering a Compiler, Morgan Kaufmann, 2004.

Reference Books:

1. K.C. Louden, Compiler Construction: Principles and Practice, Cengage Learning, 1997.
2. D. Brown, J. Levine, and T. Mason, LEX and YACC, O"Reilly Media, 1992.

BCO007C	COMPUTER GRAPHICS	3-0-0 [3]

OBJECTIVE:

- To provide students with a foundation in graphical applications programming
- To introduce students with fundamental concepts and theory of computer graphics
- To give basics of application programming interface (API) implementation based on graphics pipeline approach

UNIT 1	**Basic of Computer Graphics:** Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards
UNIT 2	**raphics Primitives:** Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers. Aliasing, and introduction to Anti Aliasing (No anti aliasing algorithm).
UNIT 3	**Two Dimensional Graphics:** Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang bersky, NLN), polygon clipping
UNIT 4	**Three Dimensional Graphics**: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.
UNIT 5	**Three Dimensional Graphics:** 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.

Course Outcome (CO):

At the ends of this course studentswill have:

CO1: Understand the basics of computer graphics, different graphics systems and applications of computer graphics
CO2: Apply and compare the algorithms for drawing 2D images
CO3: Analyze and apply clipping algorithms and transformation on 2D images
CO4: Explore projections and visible surface detection techniques for display of 3D scene on 2D screen
CO5: Understand visible-surface determination and hidden surface elimination for creating computer graphics applications

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H			M	L								M		
CO2			M	L					L		L			L	
CO3			L		L						M	L	L		M
CO4			H							L					L
CO5	H	M		L					M				M	L	

H = Highly Related; M = Medium L = Low

Text Books:

1. Donald Hearn and Pauline Baker, Computer Graphics with OpenGL (third edition), Prentice Hall, 2003

Reference Books:

1.F. S. Hill Jr. and S. M. Kelley, Computer Graphics using OpenGL (third edition), Prentice Hall, 2006
2. Peter Shirley and Steve Marschner, Computer Graphics(first edition), A. K. Peters, 2010
3. Edward Angel, Interactive Computer Graphics. A Top-Down Approach Using OpenGL (fifth Edition), PearsonEducation, 2008

BCO 031B	Compiler Design Lab	0:0:2 [1]

List Of Experiments

1 Familiarization with LEX by writing simple specifications for tokens such as identifiers, numbers, comments in C/C++, etc. All LEX specifications must be compiled andexecuted with appropriate inputs. At least ten such exercises must be completed in two labclasses.
2 LEX specification for tokens of the small language in ALSU‟s book
3 Complete the specifications in (2) above to make a complete lexical analyzer. (1 lab class)
4 Familiarization with YACC by writing simple specifications for desk calculator, variable declarations in C (only numbers and array). All YACC specifications must be compiled and executed with appropriate inputs. Note that this exercise also requires LEX specifications o the tokens involved. (2 lab classes)
5 YACC specifications for the syntax of the small language in ALSU‟s book (appendix A)(1 lab class)
6 Adding error recovery to (5) above to make a complete parser. (1 lab class)
7 S-attributed specification of the semantics of the small language in ALSU‟s book
8 Adding semantic error recovery to the semantic analyzer in (7) above to make a complete semantic analyzer. (1 lab class)
9 Intermediate code generation for the constructs of the small language in ALSU‟s book (appendix A) to be incorporated into the semantic analyzer of (8) above. Students doing this last assignment may be awarded bonus marks. (3 lab classes)
10 Write a programme to parse using Brute force technique of Top-down parsing.
11 Write a program for generating for various intermediate code forms
i) Three address code ii) Polish notation
12 Develop an operator precedence parser (Construct parse table also)
13 Develop a recursive descent parser

14 Develop a lexical analyser to recognize a few patterns.

BCO 015B	COMPUTERGRAPHICS LAB	0-0-2 [1]

List of Experiments

1 Write a Program to Show basic Transformation with OpenGL
2 Write a Menu Driven Program with OpenGL
3 Write a Program to draw a line using Bresenham's Algorithm with OpenGL
4 Write a Program to implement midpoint algorithm to draw circle
5 Write a Program to implement midpoint algorithm to draw ellipse
6 Program to implement 2d scaling about an arbitrary axis.
7 Write a program to implement DDA line Algorithm
8 Program to implement 2d rotation about an arbitrary axis.
9 Program to implement translation of a line and triangle.
10 Program to implement Cohen Sutherland line clipping.
11 Program to implement Sutherland Hodgeman polygon clipping.
12 Program to draw Bezier curve.
13 Program to draw b-spline curve.
14 Program to implement a line using slope intercept formula.
15 Write a program to implement Bresenham 's Algorithm

Course Outcome (CO):

At the ends of this course studentswill have:

CO1: Understand the structure of modern computer graphics system
CO2: Understand the basic principles of implementing computer graphics primitives.
CO3: Familiarity with key algorithms for modeling and rendering graphical data
CO4: Develop design and problem solving skills with application to computer graphics
CO5: Understand visible-surface determination and hidden surface elimination for creating computer graphics applications

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H			M	L								M		
CO2			M	L					L		L			L	
CO3			L		L						M	L	L		M
CO4			H							L					L
CO5	H		M		M			H				L	L	L	

H = Highly Related; M = Medium L = Low

CSE Track
Department Elective 5

BCO 361A	**NATURAL LANGUAGE PROCESSING**	**3-1-0 [4]**

OBJECTIVE:

- Explain about Natural Language Processing
- Understand Words & Vectors
- Implement various processing techniques like
- End-to-end models for Speech Processing
- Deep Learning for Speech Recognition
- Tree Recursive Neural Networks and Constituency Parsing
- Recurrent neural networks for language modelling

UNIT 1	Introduction to Natural Language Processing, Types of NLP systems, How computer understands text, Terminologies used in NLP, Steps Involved in NLP, Steps involved in pre-processing, Pipeline of NLP Problems o Challenges in NLP
UNIT 2	Concepts of words and vectors, Techniques of converting words to numbers, GloVe Word Embeddings, Word2Vec and its types, such as Skip Gram, Model and Continuous BOW, Advanced word vectors, limitations of CBOW and Skip Gram
UNIT 3	Word window classification, Dependency parsing, Constituency parsing o Machine translation, Attention, End to end models for speech processing
UNIT 4	Deep learning for speech recognition, Tree recursive neural networks o RNN for language modelling, Dynamic neural network for question answering
UNIT 5	Smart Home Services Provider Uses Natural Language Generation to Create Highly Personalized Website Copy, Online Education Company Improves Customer Support with Autosuggestion of Macros, Using Natural Language for Health care Summaries, Microsoft Gets the Pulse of Customer Sentiment with Natural Language Processing

Course OUTCOME (CO):

CO1: Understand the basics of Natural Language Processing
CO2: Explore the facets of words and vectors.
CO3: Understand word window classification.
CO4: Understand the deep learning concepts for speech recognition.
CO5: Explore NLP employing case studies.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	L	M	M	L		L			L	L	L	L	M	H	M
CO2	L	M	H	H	H	L			L			L	H	H	H
CO3	L	H	H	H	H	L						L	H	H	H
CO4	L	M	H	H	H	L	L					L	H	H	H
CO5	L	M	M	M	H	L			L			L	M	H	H

H = Highly Related; M = Medium; L = Low

Text Books:

- Jurafsky, David, and James H. Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Upper Saddle River, NJ: Prentice-Hall, 2000. ISBN: 0130950696.

Reference Books:

- Manning, Christopher D., and Hinrich Schütze. Foundations of Statistical Natural Language Processing. Cambridge, MA: MIT Press, 1999. ISBN: 0262133601.

BCO 362A	**NATURAL LANGUAGE PROCESSING Lab**	**3-1-0 [4]**

Natural Language Processing Lab
List of Programs

1. Text Classification using Word Embeddings.
2. Find Synonyms and antonyms using Word Embeddings.
3. Introduction to Topic Modelling.
4. Converting a Foreign Language to English using Machine Translation(German to English).
5. Twitter Sentiment Analysis.
6. Explaining Lemmatization, PoS Tagging,
7. Stemming and Tokenization using an Example.
8. Understanding Dependency Parsing in a given sentence.
9. Perform Speech to Text Conversion using PyAudio and Google Speech Recognition.
10. Creating Custom Speech Recognition Corpus.
11. Introduction to Dynamic Memory Network.
12. Dialog Generation using Deep Learning.

Course OUTCOME (CO):

CO1: Understand the basics of Natural Language Processing
CO2: Explore the facets of words and vectors.
CO3: Understand word window classification.
CO4: Understand the deep learning concepts for speech recognition.
CO5: Explore NLP employing case studies.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	Program Outcome												Program Specific Outcome		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	L	M	M	L		L			L	L	L	L	M	H	M
CO2	L	M	H	H	H	L			L			L	H	H	H
CO3	L	H	H	H	H	L						L	H	H	H
CO4	L	M	H	H	H	L	L					L	H	H	H
CO5	L	M	M	M	H	L			L			L	M	H	H

H = Highly Related; M = Medium; L = Low

Text Books:

- Jurafsky, David, and James H. Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition. Upper Saddle River, NJ: Prentice-Hall, 2000. ISBN: 0130950696.

Reference Books:

- Manning, Christopher D., and Hinrich Schütze. Foundations of Statistical Natural Language Processing. Cambridge, MA: MIT Press, 1999. ISBN: 0262133601.

BCO 069A	Advance Programming in Java Lab	0-0-2

Exp.No.	Name of the Experiment
1	Design a registration page using HTML.
2	**Implementing JDBC** Program 2(A)Write a program by using JDBC to execute insert, select and update query by using PreparedStatement and display the results. Program 2(B) Write a program by using JDBC to execute an update query by using PreparedStatement and display the results. Program 2(C) Write a program and execute ResultSetMetaData Interface by using JDBC.
3	**Implementing Servlet** Program 3(A) Write a program and execute a simple servlet demonstrating servlet lifecycle. Program 3(B) Write a program and execute a servlet program that receives input from html page. Program 3(C) Write a program and execute ServletRequest and ServletResponse Interfaces with methods. Program 3(D) Write a program and execute HttpServlet Class doGet() and doPost() Methods. Program 3(E) Write a program to store the user information into Cookies. Write another program to display the above stored information by retrieving from Cookies.
4	**Implementing JSP,JSP Custom Tags and Directives** Program4(A) Write a program to connect HTML page,JSP page and mysql database.Program 4(B) Write a program and implement custom tags in JSP Program 4(C) Write a program and implement JSP directives.
5	**Implementing JavaBean** Program 5 Write a program and implement Javabeans using JSP page.
6	**Implementing JSP Standard ActionElements** Program 6 Write a program and implement JSP StandardActionElements.
7	**Implementing JSP Scripting Elements** Program 7:Write a program and execute JSP Scriptlets,Declarations and Expressions.
8	**Learning session management** Program 8(A):Write program and execute session management using URL rewriting Program 8(B) :Write program and execute session management using Hidden Fields. Program 8(C): Write program and execute session management using Cookie Program 8(D): Write a program and execute session management using Session Objects.
9	**Remote Method Invocation (RMI)** Program 9(A):Write a program and execute Remote Method Invocation

10 **Configure web.xml**

Program 10:Write a code to deploy web.xml file

11 **Performing Client-Server Communication and Networking**

Program 11(A): WAP to implement Client-Server Program
Program 11(B): WAP to implement InetAddress.
Program 11(C): WAP for Sending Email in java

12. **Implementing Multithreading**

Program 12: WAP to implement multithreading(three threads using single run method).

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	**Program Outcomes**												**Program specific Outcomes**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			H	L	H		L			M	H			H	
CO2		L	H		H	L		L					M	H	
CO3			H	M					L	L		M		H	
CO4				M	H			M			L			H	M
CO5		L			H	M			M					H	

CSE Track
Department Elective 5

BCO615A	**QUANTUM COMPUTING**	**Total Credits: 3**

Course Objectives:

1. To introduce the basic principles of quantum mechanics, linear algebra, and Dirac notation relevant to quantum computing.
2. To explain quantum entanglement, quantum algorithms, and quantum channels with foundational understanding.
3. To provide exposure to quantum cryptography and quantum communication protocols.
4. To familiarize students with practical quantum computing using IBM Quantum and associated simulators for basic quantum programming and analysis.

UNIT 1	**Fundamentals of Quantum Mechanics:** Introduction to quantum mechanics and linear algebra concepts for quantum computing, including quantum states in Hilbert space, Dirac notation, Bloch sphere, density operators, superposition and measurement postulates. Covers uncertainty principle, no-cloning theorem, and basics of quantum dynamics with unitary transformations and Schrödinger equation applications.
UNIT 2	**Quantum Correlations:** Study of quantum correlations and entanglement, Bell's theorem and Bell inequalities, and Schmidt decomposition. Includes applications like superdense coding, quantum teleportation, and entanglement swapping, emphasizing their role in quantum networks and information processing.
UNIT 3	**Quantum Cryptography**: Introduction to quantum cryptography and its distinction from classical methods, focusing on QKD protocols such as BB84 and E91. Covers security analysis, eavesdropping, no-cloning implications, and applications of QKD in secure communications and cryptographic infrastructures.
UNIT 4	**Quantum Gates and Algorithms**: Overview of quantum gates such as Pauli, Hadamard, phase, T-gate, CNOT, and Toffoli, along with universal gate sets and quantum circuits. Introduces key algorithms like Deutsch–Jozsa, Grover's search, and Shor's factoring, highlighting quantum speedup and computational complexity.
UNIT 5	**Quantum Programming:** Hands-on quantum programming using IBM Quantum (IBMQ) and Qiskit simulators, constructing and analyzing quantum circuits, performing quantum measurements, and visualizing states. Includes implementing basic algorithms, error mitigation concepts, and executing circuits on real IBM quantum hardware.

Course Outcomes

Upon successful completion of this course, the student will be able to:

CO1: Understand fundamental quantum mechanical principles and their application to quantum information processing.
CO2: Analyze quantum entanglement, correlations and their role in quantum communication protocols.
CO3: Apply quantum cryptography techniques for secure key distribution and evaluate their security properties.
CO4: Design and interpret basic quantum circuits and algorithms demonstrating quantum speedup.
CO5: Implement and test quantum programs using IBM Quantum tools and analyze the effect of noise and errors on computation.

Textbooks

1. Phillip Kaye, Raymond Laflamme, et al., *An Introduction to Quantum Computing*, Oxford University Press, 2007.
2. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2020.
3. David McMahon, *Quantum Computing Explained*, Wiley-Interscience, IEEE Computer Society, 2008.

References

1. Michael A. Nielsen & Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 2013.
2. Eleanor G. Rieffel & Wolfgang H. Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2014.

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	**Program Outcome**												**Program Specific Outcome**		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	M	L	L	L	L	L	L	L	M	L	M	H	M	H
CO2	M	H	M	L	L	L	L	L	L	M	L	M	H	M	M
CO3	M	M	H	M	L	L	L	L	L	M	L	M	M	H	M
CO4	M	H	H	M	M	L	L	L	L	H	L	M	H	H	M
CO5	L	M	H	H	H	L	L	L	L	H	L	M	H	H	L

H = Highly Related; M = Medium L = Low

CSE Track
Department Elective 6

BCO 029B	**DATA MINING &WAREHOUSING**	**3:0:0 [3]**

OBJECTIVE:

- To compare and contrast different conceptions of data mining.
- To explain the role of finding associations in commercial market basket data.
- To characterize the kinds of patterns that can be discovered by association rule mining.
- To describe how to extend a relational system to find patterns using association rules.
- To evaluate methodological issues underlying the effective application of data mining.

UNIT 1	Introduction: Basic concepts of data mining, including motivation and definition; different types of data repositories; data mining functionalities; concept of interesting patterns; data mining tasks; current trends, major issues, and ethics in data mining
UNIT 2	Data: Types of data and data quality; Data Preprocessing: data cleaning, data integration and transformation, data reduction, discretization, and concept hierarchy generation; Exploring Data: summary statistics, visualization, multidimensional data analysis
UNIT 3	Association and Correlation Analysis: Basic concepts: frequent patterns, association rules - support and confidence; Frequent itemset generation - Apriori algorithm, FP-Growth algorithm; Rule generation, Applications of Association rules; Correlation analysis
UNIT 4	Clustering Algorithms and Cluster Analysis: Concept of clustering, measures of similarity, Clustering algorithms: Partitioning methods - k-means and k-medoids, CLARANS, Hierarchical methods - agglomerative and divisive clustering, BIRCH, Density-based methods - Subspace clustering, DBSCAN; Graph-based clustering - MST clustering; Cluster evaluation; Outlier detection and analysis.
UNIT 5	Data Mining Algorithms: Partitioned Algorithms, Hierarchical Algorithms, Density-Based Algorithms, Grid-Based Algorithms, Web Content Mining, Web Structure Mining, Web Usage Mining, Spatial Mining, Multimedia Data Mining, Text Mining. Case Study.

OUTCOMES: At the end of the course, the student should be able to:

- Compare and contrast different conceptions of data mining.
- Explain the role of finding associations in commercial market basket data.

- Characterize the kinds of patterns that can be discovered by association rule mining.
- Describe how to extend a relational system to find patterns using association rules.
- Evaluate methodological issues underlying the effective application of data mining.
- **MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:**

Course Outcomes	Program OutComes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H		M										M		M
CO2	M		M		M								H		
CO3	H	M		L			I						H	M	
CO4	M		H	M		M								H	
CO5	M	H											M		

- H = Highly Related; M = Medium L = Low

Text Books:

1. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Introduction to Data Mining. Pearson (2005), India.ISBN 978-8131714720

2. Jiawei Han and MichelineKamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 3rd edition (July 2011), 744 pages. ISBN 978-0123814791

Reference Books:

1. T. Hastie, R. Tibshirani, and J. H. Friedman, The Elements of Statistical Learning, Data Mining, Inference, and Prediction.Springer, 2nd Edition, 2009.768 pages. ISBN 978-0387848570

2. C. M. Bishop, Pattern Recognition and Machine Learning.Springer, 1st edition, 2006.738 pages. ISBN 978-0387310732

3. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, 3rd edition (January 2011).664 pages. ISBN 978-0123748560.

CSE Track
Department Elective 7

BCO215B	Web development using WordPress	3-0-1 [3]

Web development using WordPress

Course objective:-Student will be able to design and develop websites using WordPress tool.

UNIT 1	**Introduction to CMS:** Introduction to Content Management Systems, Main Features of CMS, Web Content Management System, Component Content Management System, Enterprise Content Management System, Introduction of Blogs. Installing WordPress with a Web Host's "1-Click Install", Manually Installing WordPress
UNIT 2	**Introduction to WordPress:** Introduction to WordPress, Setting up WordPress, Setting Up Database, Overview of Working of WordPress, Dashboard, Exporting and Importing of Site Content, Backup of Site data and files, Upgrading WordPress, Settings: General, Writing, Reading, Discussion, Media, Privacy, Permalinks, Configuring and Managing Accounts, Adding Content: Post, Pages, Setup and use of Categories, Tags, Internal Linking
UNIT 3	**Advance Features for WordPress:** Working with media: using Media Library, Audio and Video Files, Managing Comments, Fighting Spam with Akismet, Syndication: Setup and Display of RSS Feed, Setup of Subscriptions, use of Google FeedBurner with WordPress, Widgets and Plug-ins: Use of Widgets and Plug-ins, Differences, Upgrade of Plug-ins. Adding an Image Gallery, Editing an Existing Image Gallery, Adding Video Embedding Responsive Videos, Uploading a Video File,
UNIT 4	**Customization with WordPress** Introduction to WordPress Themes, Customized WordPress Theme: Default Theme, New Theme, Theme Editor, Set up of Menus, Post Thumbnails, Customization of Themes: Custom CSS, addition of Frames, Getting Fancy with Themes: Customization of Themes with CSS, addition of Favicon, Editing Function files, Advanced Theme Development: Anatomy of WordPress theme, Building new Theme, Template Files, Template Tags, Use of Loop, Custom Post Types and Custom Taxonomies, One Installation and Multiple blogs: Setup and Administration of Blog Network, Customization of WordPress: Integration of Third Party Services, Third Party Comment System, AD Integration, Web Fonts, Tools and Tricks
UNIT 5	**WordPress Security, Performance & Deployment** Website Security (SSL, Backups, Anti-malware Plugins), Performance Optimization (Caching, Image Optimization, CDN), SEO for WordPress (Yoast SEO, RankMath), Migrating Websites (Local to Live Server), Career Pathways: Freelancing, Agencies, and Personal Branding.

Course Outcomes

CO1:- To be able to understand concepts of content management system, its benefits.
CO2:- Understand installation and configuring word press for web development
CO3:- To be able to work with video and audio files with their plug-ins in websites

CO4:- To be able to create websites more attractive by using themes and CSS, increasing usability by adding hyperlinks.

CO5:Able to create interactive web sites

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcome	**Program Outcome**												**Program Specific Outcome**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L	M	L	M							L	L		
CO2	L		M		M									L	M
CO3		L		M	H				M		M		M	M	M
CO4		M	L	M	H				M		M	M	M	H	H
CO5	H	H	L	M	M			L	M		M	M	H	M	L

H = Highly Related; M = Medium L = Low

References:

1. Building Web Apps with WordPress: WordPress as an Application Framework 2nd Edition by Brian Messenlehner, Jason Coleman

2. WordPress for Beginners 2020: A Visual Step-by-Step Guide to Mastering WordPress (Webmaster Series) by Dr. Andy Williams

3. WordPress 5 Complete - Seventh Edition by Karol Krol