JECRC™ UNIVERSITY

BUILD YOUR WORLD

School of Engineering

Syllabi and Course Structure

B. Tech. (AI & DS)
(2024-2028)
Academic Programmes

April 2024

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)

Course Structure for 2024-2025 Batch

Semester I

Subject Code	Subject	Contact Hours L-T-P	Credits	
DEN001A	Communication Skills	2-0-0	2	F
	Communication Technique Lab	0-0-2	1	F
DMA001A	Engineering Mathematics-I *	3-1-0	4	F
DPH001A/ DCH 002A	Applied Physics	3-0-0	3	F
DCO013A	Computer Programming and Logical Thinking	3-0-0	3	F
	Fundamentals of Artificial Intelligence	3-0-0	3	F
DPH002A	Applied Physics Lab	0-0-2	1	F
DCO014A	Computer Programming and Logical ThinkingLab	0-0-2	1	F
DIN001A	Culture Education – 1	2-0-0	2	F
DCH001A/ DLW001A	Environmental Sciences/ Indian Constitution	2-0-0	NC	F
	TOTAL	**15-1-08**	**20**	

*** In semester I common to all sections**

NC- Non Credit Course, It is mandatory to clear for completion of degree.

Semester II

Subject Code	Subject	Contact Hours L-T-P	Credits	
DEN002A	Professional Skills	2-0-0	2	F
	Professional Skills Lab	0-0-2	1	F
	Mathematics for AI	3-1-0	4	F
BCO 002B	Data Structures and Algorithms	3-1-0	4	C
DCO001A	Computer Programming in C++*	3-0-0	3	F
	Web Programming	3-0-0	3	S
	Web Programming Lab	0-0-2	1	S
BCO 005B	Data Structures and Algorithm Lab	0-0-2	1	C
DIN 002A	Culture Education – 2	2-0-0	2	F
SET 001A	Engineering Workshop (diff Module)	0-0-2	1	F
DCO02A	Computer Programming in C++Lab*	0-0-2	1	F
DCH004A/ D	Environmental Sciences/ Indian Constitution	2-0-0	NC	F
	TOTAL	**18-1-8**	**23**	

B.Tech CSE III Semester

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs.	Credits	Type
1	BCO 011A	Computer Networks	3	1	0	4	4	C
3	BAS 007B	Discrete Mathematics	3	0	0	3	3	F
4	BCO 008B	Operating Systems	3	0	0	3	3	C
5		Introduction to Data Science	3	0	0	3	3	F
		Computer Network Lab	0	0	2	2	1	C
6	BCO 014B	Operating Systems Lab	0	0	2	2	1	C
	BCO ****	Programming with Python	3	0	0	3	3	S
	BCO ****	Programming with Python Lab	0	0	2	2	1	C
8	DEN 003A	Life Skills - 1 (Personality Development)	1	0	2	3	2	F
9	DIN 003A	Value Education and Ethics -1	1	0	1	1	1	F
		Total	**17**	**2**	**7**	**25**	**22**	

B.Tech CSE Semester IV

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs.	Credits	TYPE
1		Open Elective-I	3	0	0	3	3	ID
2		Programming in Java	3	0	0	3	3	S
3	BCO 009B	Computer Organization and Design	3	0	0	3	3	C
4	BCO 010C	Database Management Systems	3	1	0	4	4	C
5		Artificial Neural Network	3	0	0	3	3	S
6	BCO 013B	Database Management Systems Lab	0	0	2	2	1	C
7		Programming in Java Lab	0	0	2	2	1	S
8	DMA 003A	Soft Skills - 2 (Aptitude)	1	0	2	3	2	F
9	DIN 004A	Value Education and Ethics – 2	1	0	0	1	1	F
10		Artificial Intelligence Lab				2	1	S
		Total	**17**	**1**	**6**	**26**	**22**	

B.Tech. CSE Semester V

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs.	Credits	Type
1	BCO 017A	Formal Languages & Automation Theory	3	1	0	4	4	C
2	BCO 023A	Design & Analysis of Algorithms	3	1	0	4	4	S
3		Digital Image Processing	3	0	0	3	3	S
4		Machine Learning	3	0	0	3	3	S
5		Elective 2	3	0	0	3	3	S
7		Open Elective II	3	0	0	3	3	ID
8	BCO 025B	Design & Analysis of Algorithms Lab	0	0	2	2	1	S
9		Machine Learninglab	0	0	2	2	1	S
		Digital Image Processing lab	0	0	2	2	1	S
		Total	**18**	**2**	**6**	**26**	**23**	

B.Tech CSE Semester VI

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs.	Credits	TYPE
1	BCO 028A	Compiler Construction	3	1	0	4	4	C
2		Big Data Analytics with R	3	0	0	3	3	S
		Deep Learning	3	0	0	3	3	S
3		Elective 3	3	0	0	3	3	S
4	BCO 031B	Compiler Design Lab	0	0	2	2	1	C
5		Deep learning lab	0	0	2	2	1	S
6		**Open Elective III**	3	0	0	3	3	ID
		Big Data Analytics with R Programming lab	0	0	2	2	1	S
7	BCO 074B	Minor Project	0	0	8	8	4	C
		Total	**15**	**1**	**12**	**28**	**23**	

B.Tech. CSE Semester VII

Sr. No.	Course Code	Course Title	L	T	P	Contact Hrs.	Credits	Type
1		Elective 4	3	0	0	3	3	S
3		Elective 5	3	0	0	3	3	S
4		Open Elective IV	3	0	0	3	3	ID
7	BCO 207A	Research Paper Writing	0	0	2	2	1	S
		Total	**15**	**0**	**4**	**19**	**10**	

B.Tech. CSE Semester VIII

S. No.	Code	Subject	L	T	P	Contact Hrs.	Credits	Type
1	BCO 034B	Industrial Project/Dissertation	0	0	20	20	20	C
		TOTAL	0	0	20	20	20	

List of proposed Elective Courses

Area Cluster	Specific Subject Titles	Course Credit
Machine Learning & Intelligence Systems	• Ethical AI • Optimization in ML • Reinforcement learning • IOT based Robotics • Game Theory and Strategic Decisions • **Harnessing Generative AI with ChatGPT**	3-0-0
Data Analytics	• Data Mining and Warehousing • Data Visualization and Interpretation • Data Analytics • **Data Visualization with Tableau**	3-0-0
Speech, Vision, and Text	• Deep Learning for NLP • Digital Image Processing • Computer Vision • Augmented Reality in Unity & Xcode • **Virtual Reality and Augmented Reality**	3-0-0

Security	• Digital Forensic • Embedded System Security • Security in IoT Devices • Information System security • Intrusion Detection • Cryptography • Blockchain Technologies	3-0-0

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

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

L-T-P	Communication Skills	Credits 2-0-1 3

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 that 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

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

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

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

BAS001C	**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 conceptsandtoolsthatwillserveasbuildingblockstowardstacklingmoreadvancedlevelofmathematicsthattheyarelikely
- Tofindusefulintheirprofessionwhenemployedinthefirm/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	Vectorscovering,lawsof vectoralgebra,operations-dot,cross,tripleproducts;Vector function-limits,continuityandderivatives,geometricinterpretation; Gradient,divergenceandcur-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

BAS 010E	APPLIED PHYSICS	Total Credits: 3

Course Objectives:

1. Students will be able to demonstrate competency and profound understanding of the concepts in Quantum Mechanics and its applications, and band formation.
2. Students will be able better to understand and learn to design the laser system and its component, or process to meet desired needs within realistic constraints such as health and safety, manufacturability.
3. The graduates will able to understand the applications of quantum optics through Holography and communication through optical fibers.
4. Students will be able to know the application of optical technologies and the development of new technologies like photonics, spintronics, quantum computing and Nano-technology.

UNIT 1	**Quantum Mechanics:** Overview- Development of Quantum Mechanics, Compton Scattering, Wave Particle Duality, Uncertainty's Principle, Phase and Group velocities, Wave Packet, - Physical significance and its properties, Operators, Expectation values. Schrödinger's Time dependent and time independent Equations. **Applications:** Schrödinger's Equation and its Solution for particle in one-dimensional box and three-dimensional box. Degeneracy. Quantum statistics. *Overview of **AlphaDecay, Scanning and Tunnelling Microscopes**.
UNIT 2	**Free Electron Gas Model and its Applications:** Overview – Classical theory of Free electron, Quantum theory of free electrons, Density of energy states, Fermi energy levels. Band Theory of solids: formations of band, Band Gap in solids, Semiconductors: Intrinsic and Extrinsic, Carrier Concentrations, Position of Fermi levels in semiconductors, Conductivity and Mobility due to electrons and holes. **Solar cells** and **Photo cells**.
UNIT 3	**Quantum Optics: Coherence**: Spatial and Temporal coherence, Coherence length, Coherence time. Visibility as a Measure of Coherence. Spatial Coherence and Size of the Source. Temporal Coherence and Spectral Purity. **Laser:** Einstein's coefficients, Threshold conditions for laser action. Types of Lasers- Ruby laser, He-Ne laser. Semiconductor laser. Elementary ideas of Q-switching and Mode Locking. Idea of Homojunction and Hetrojunction lasers.
UNIT 4	**Holography**: Holography versus photography. Basic theory of Holography. Applications of Holography in Microscopy and Interferometry. **Optical Communication**: Optical fiber as optical wave-guide. Construction, Numerical Aperture and Angle of Acceptance. Applications and Types of optical fibres.
UNIT 5	**Applications of Optical Technologies:** Determination of thickness of thin films using interference technique. Elementary idea of anti-reflection coating. Optical filters. Applications of Diffraction: Bragg's law of X-Ray Diffraction. Polaroids and their industrial applications. **Overview of Upcoming Technologies** * Photonics * Spintronics * Quantum Computers * Nanotechnology and Nano-materials. Carbon Nano-tubes (CNTs).

Course Outcomes

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

CO1: To learn the fundamental concepts on Quantum behaviour of matter in its micro state and its applications.
CO2: Analyze and apply band theory of Solids in Solid State Physics and Electronics.
CO3: Understand and apply techniques of LASER and coherent radiations in industry, medical, and day-to-day life activities.
CO4: Apply concepts learnt in Quantum optics in Industry and in real life.
CO5: Understand and importance of Spintronics to develop storage device with low threshold power, spin based transistor, Photonics for techno-farming, and Nano-technology for saving environment, advances in medical and energy efficiency in fuel cell.

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. A. K. Ghatak and Thyagrajan, Fiber Optics, Oxford University Press.
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		L		H		L					L	
CO2			L		M		L		M	H		L		H	
CO3		M								L		M			M
CO4					H								H		
CO5			H				M						H		

H = Highly Related; M = Medium L = Low

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

BES001B	Basic Electronics Engineering	3-0-0	3

Objective

- To understand basic concepts required in understanding electronic circuits
- To understand the concept of Semiconductor Diode and their applications.
- To understand the concept of Opto-Electronic Devices.
- To understand the concept of BJT and their configurations. As well as the concept of Field Effect Transistor with their various configuration.
- The student will be able to understand fundamental circuit analysis techniques and basic electronics backgrounds, including PN Diode, BJT and MOSFET.
- The student will be able to understand the concept of Various Binary Number Systems and conversions.
- To understand Logic Gates and Logic Circuit focussing on basic and universal gates.

UNIT 1	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 Ntype materials, resistivity, conductivity, mobility.
UNIT 2	Semiconductor Diode, PN diode-construction, working and V-I plot, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters with calculation of ripple factor and efficiency, Breakdown Mechanisms, Zener Diode – construction, Operation, characteristics; Opto-Electronic Devices – LEDs, Photo Diode, SCR.
UNIT 3	Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations-(construction, Properties, Input and output graphs), Operating Point, Biasing configurations: Fixed Bias, Emitter bias and Voltage Divider Bias Configuration;
UNIT 4	Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs (Construction, Input characteristics and transfer characteristics).

UNIT 5	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, Boolean Algebra, De Morgan's Theorems, Realization of other gates using NAND and NOR.

Course Outcome (CO):

At the end of this course students will have:

CO1-Ability to understand the physical properties of different types of semiconductors used in fabricating devices.

CO2- Ability to understand the functioning of PN junction diode and explains its main application as rectifiers and opto-electronic devices.

CO3-Ability to understand the surprising action of BJT and explains its working and biasing in three configurations

CO4-Ability to understand the working of JFET and MOSFET.

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	PSO1	PSO2	PSO3
CO1	M	H							L	
CO2	M	H						L	H	L
CO3			H	M	L					M
CO4				H	H			H		
CO5						H	H			M

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

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

BES023A	Computer Programming in C++	**3: 0:0 3**

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, Object-Oriented Paradigm, Abstract Data Types, I/O Services, Standard Template Library, Standards Compliance, Functions and Variables. Declaration and Definition
UNIT 2	Variables: Dynamic Creation and Derived Data, Arrays and Strings in C++,Classes in C++, Defining Classes in C++, Classes and Encapsulation, Member Functions, Friend function ,Inline function
UNIT 3	Using Constructors, Multiple Constructors and Initialization Lists, 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. Constructor and Destructor Calls in 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.

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	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	M												M		
CO2			H		H									H	L
CO3			H		M				M		M		H		
CO4				L								M		L	

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:Bjarne Stroustrup

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

BAS012E	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	To convert a Galvanometer into an Ammeter of given range and calibrate it.
2	To convert a Galvanometer into a Voltmeter of given range and calibrate it.
3	To study the variation in resistance of a Semiconductor with temperature and to determine its energy bandgap.
4	To determine specific Resistance of a wire by Carrey-Foster's Bridge.
5	To determine the height of an unknown object using Sextant.
6	To determine Resolving power of Telescope.
7	To determine Dispersive Power of a Prism using Mercury light source and Spectrometer.
8	To determine the wavelength of prominent lines of Mercury by using plane Diffraction Grating and Spectrometer.
9	To measure Numerical Aperture of an Optical Fiber.
10	To determine the profile of He-Ne LASER beam.
11	To determine wavelength of Sodium light source using Newton's Rings experiment.
12	To study shift in fringes in interference experiment using Michelson's interferometer
13	To study the characteristics of Solar Cell
14	To study the photelectric effect and determine the Planck's constant "h".
15	To verify the Brewster's law and to find the Brewster's angle
16	To study the polarization of Laser light using polarimeter.

Course Outcomes-

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

CO1: Demonstrate the working knowledge of fundamental Physics, that of Electricity, Electronics and Mechanics and their applications in engineering disciplines.
CO2: The ability to formulate, conduct, analyze and interpret experiments in engineering physics.
CO3: Use modern engineering physics techniques and tools, including laboratory instrumentation.
CO4 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 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		L					L	
CO2			L		M		L		M	H		L		H	
CO3		M								L		M			M
CO4					H								H		

H = Highly Related; M = Medium L = Low

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

BES002A	Engineering Graphics	0: 0:2 2

Course Objective:

- Increase ability to communicate with people
- Learn to sketch and take field dimensions.

Exercise 1: Draw sheet of Lettering, Scale: Plain Scale, Diagonal Scale,

Exercise 2: Draw sheet of Conic Curves: parabola, hyperbola & ellipse.

Exercise 3: Draw sheet of Engineering Curves: Cycloid, Epicycloid, Hypocycloid and Involute.

Exercise 4: Draw sheet of Projection of points & projection of lines.

Exercise 5: Draw sheet of Projection of planes

Exercise 6: Draw sheet of projection of solid-I

Exercise 7: Draw sheet of projection of solid-II

Exercise 8: Draw sheet of sections and section views.

Exercise 9: Draw sheet of Orthographic projections: first angle of projection.

Exercise 10: Draw sheet of Orthographic projections: Third angle of projection.

Exercise 11: Draw sheet of Isometric projections and view.

Exercise 12: Draw sheet of development of surfaces.

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

CO1. Students will be able to draw orthographic projections and sections.
CO2. Student's ability to use architectural and engineering scales will increase.
CO3. Student will be able to read drawing of given object
CO4. Student will differentiate first angle and third angle projection

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
CO1				H	L									L
CO2			L		M									H

CO3		M												
CO4					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

BES 025A	Computer Programming in C++Lab	0:0:2

1. 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.

2. Write a Program to Understand Structure & Unions.

3. 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. Scope resolution operators, accessing an object's data members and functions through different type of object handle name of object, reference to object, pointer to object, assigning class objects to each other.

4. Write a Program, involving multiple classes (without inheritance) to accomplish a task &demonstrate composition of class.

5. Write a Program to Demonstrate Friend function, classes and this pointer.

6. Write a Program to Demonstrate Inline functions.

7. Write a Program to Demonstrate pointers to derived classes.

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

9. 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.

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

11. Write a Program for multiple inheritance, virtual functions, virtual base classes, abstract classes

12. Write a Program to Demonstrate use of Constructors and Destructors.

13. Write a Program to Develop with suitable hierarchy, classes for Point, Shape, Rectangle, Square, Circle, Ellipse, Triangle, Polygon, etc. Design a simple test application to demonstrate dynamic polymorphism.

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

L-T-P	Cultural Education I	Credits 2-0-0 2

Course Objectives

1. To make the students feel gratitude towards the rich religious and cultural heritage of India.
2. To understand the role of great personalities and movements in the progress of India.

Course Outcomes (CO):

At the end of this course students will have:

CO1: Ability to acknowledge and appreciate the richness of Indian Culture
CO2: Ability to represent the culture ethics in real life

UNIT-I Holy Scriptures-A

1. Introduction to Vedanta and Bhagavad Gita, Goals of Life – Purusharthas, Introduction to different DhramGranthas (Various religious scriptures from Hindu, Muslim, Christian, Bodh, Jain religions)
2. Introduction to Yoga, Overview of Patanjali's Yoga Sutras

UNIT-II Society and Culture-I

3. Introduction to Indian Culture and Major Symbols of Indian Culture
4. Major Indian Cultural and Ethical Values- Respect, Compassion, Kindness, Forgiveness, Introspection, Honesty, Justice, Loyalty, Devotion, Self Sacrifice, Hospitality, VasudhevKutumbkum

UNIT-III India in Progress-I

5. Education , Science and Technology in Ancient India
6. Values from Indian History- War of Mahabharta, War of Kalinga, Freedom Struggle of India, Major Farmer Movements, Major Religious and Social Upliftment Movements

UNIT-IV Great Indian Personalities-I

7. Life and works of the Great People of India- Sushruta, Dadhichi, Ashtvakra, Anusuya, Panini, Charaka, Kalidas, Aryabhatta, Samudragupta, Ashoka, Chandragupt Mourya, Porus, Satyabhama, Dhruv, Prahlad,Chankya,Varahmihira, Bhism, Karan, Dronacharya, MeeraBai, Surdas, Dadudayal, Kabir, Mahatma Budhha, Mahavir,Guru Nanak Dev,Guru Gobind Singh, Mohammad Saheb, Jesus Christ, Veer Shivaji, MaharanaPratap, Maharani LaxmiBai, MaharaniPadmini, Hadi Rani ShalKanwar, PannaDhai

*****Each student shall write a detailed Report/ Critique on one topic from section -A to C and one Great Personality from Section- D leading to publication of Newspaper/ Magazine article or a review paper in a Research Journal. In addition to s/he will be required to make a Power Point Presentation on the learning and face Viva-voce by committee of teachers.

Suggested Reading:

1. Glory of Indian Culture (English) Paperback byGiriraj Shah

2. Historicity of Vedic and Ramayan Eras: Scientific Evidences from the Depths of Oceans to the Heights of Skies by SarojBala , Kulbhushan Mishra

References

https://knowindia.gov.in/culture-and-heritage/lifestyle-values-and-beliefs.php

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

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

L-T-P	Professional Skills	Credits 2-0-1 3

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

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

L-T-P	Professional Skills Lab	Credits 2-0-1 3
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	

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

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.

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

	Mathematics for AI	**3:1:0 [4]**

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

UNIT1	Linear Algebra Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors , Identity and Inverse Matrices, Linear Dependence and Span, Norms, Special Kinds of Matrices and Vectors, Eigen decomposition, Singular Value Decomposition, The Moore-Penrose Pseudoinverse, The Trace Operator, The Determinant, Principal Component Analysis.
UNIT2	Probability and Information Theory, Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, The Chain Rule of Conditional Probabilities, Independence and Conditional Independence, Expectation, Variance and Covariance, Common Probability Distributions ix. Useful Properties of Common Functions, Technical Details of Continuous Variables, Information Theory, Structured Probabilistic Models
UNIT3	Independence and Conditional Independence, Expectation, Variance and Covariance, Common Probability Distributions ix. Useful Properties of Common Functions, Technical Details of Continuous Variables, Information Theory, Structured Probabilistic Models
UNIT4	Statistical inference: statistical decision theory, statistical assumptions, estimation theory. Methods of estimation: method of moments, method of minimum variance.
UNIT 5	Statistical hypothesis testing, null and alternate hypotheses. Simple and composite hypotheses, Type-I and Type-II errors, Z-tests for difference of means, chi-square test, tests for correlation and regression.

Text Books and Reference Books:

1. Linear Algebra, Gilbert Strang, MIT Cambridge Press
2. Foundations of Learning, Julie Fisher, Open University Press
3. Foundations of Learning, Laurie L. Hazard, Jean-Paul Nadeau, Pearson
4. Probability and Statistics for Machine Learning, Anirban Das Gupta, Springer

Outcomes:

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

CO1:.
CO2:
CO3:
CO4:
CO5

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															
CO2															
CO3															
CO4															
CO5															

H = Highly Related; M = Medium L=Low

B. Tech. (Common to all) – Semester I/II
Contact Hrs per week (L-T-P): 3-0-0

BES005B	**Basic Electrical Engineering**	**3: 0:0 3**

OBJECTIVE:
The objective of this course is to provide the students with an introductory treatment of the field of Electrical Engineering.

Unit 1	**DC Circuit & Theorems –** Ohm's law, KCL & KVL, Voltage & Current Sources, Star-Delta and Delta-Star transformations, Nodal & Mesh Analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem
Unit 2	**Single Phase Circuits -** Definition of average value, root mean square value, form factor and peak factor of sinusoidal voltage and current and phasor representation of alternating quantities; Analysis with phasor diagrams of R, L, C, RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor, series, parallel and series- parallel circuits.
Unit 3	**Three Phase AC Circuits**: Necessity and Advantages of three phase systems, Generation of three phase power, definition of Phase sequence, balanced supply and balanced load; Relationship between line and phase values of balanced star and delta connections.
Unit 4	**Transformers -** Principle of operation and construction of single phase transformers (core and shell types). EMF equation, losses, efficiency and voltage regulation
Unit 5	**Rotating Electrical Machines** –Construction &Working principle of DC machine as a generator and a motor; EMF equation of DC generator; torque equation of DC motor. Back EMF of DC Motor. Induction Motors – Construction & Working principle and of single phase induction motor, Applications of dc machines and single phase motors.

COURSE OUTCOMES:

- To understand and analyze basic electrical circuits
- To connect the electrical circuits with various components and calculate desired outputs.
- To understand working and applications of different electrical machines (AC and DC).

Text Books:

3. Nagsarkar and Sukhija, Basic Electrical Engineering, Oxford Uni. Press.

Reference Book:

1. Nagrath I.J. and D. P. Kothari, Basic Electrical Engineering, TMH
2. Kulshreshtha DC, Basic Electrical Engineering, Tata McGraw Hill
3. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall, India
4. Hughes, E., Electrical Technology. Pearson

BCO 035B	**Programming in Java**	**3:0:0 [3]**

Objective

- Cover issues related to the definition, creation and usage of classes, objects and methods.
- Discuss the principles of inheritance and polymorphism and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces.
- Provide the foundation of good programming skills by discussing keys issues to the design of object-oriented software, including programming design patterns, automatic documentation techniques and programming testing.
- Cover the basics of creating APIs as well as allow students to explore the Java Abstract Programming Interface (API) and Java Collection Framework through programming assignments.
- Discuss basic principles and tools of collaborating programming (versioning systems, code review) and study their usage through group programming projects.

UNIT 1	**Java Fundamentals:** Features of Java ,OOPs concepts , Java virtual machine , Reflection byte codes ,Byte code interpretation , Data types, variable, arrays, expressions, operators, and control structures , Objects and classes
UNIT 2	**Java Classes:** Abstract classes ,Static classes ,Inner classes ,Packages,Wrapper classes Interfaces ,This ,Super ,Access control
UNIT 3	**Exception handling:** Exception as objects ,Exception hierarchy ,Try catch finally ,Throw, throws
UNIT 4	**IO package:** Input streams ,Output streams ,Object serialization ,De serialization ,Sample programs on IO files ,Filter and pipe streams
UNIT 5	**Multi threading:** Thread Life cycle ,Multi threading advantages and issues ,Simple thread program ,Thread synchronization .GUI: Introduction to AWT programming, Layout and component managers ,Event handling ,Applet class ,Applet life-cycle ,Passing parameters embedding in HTML ,Swing components – JApplet, JButton, JFrame, etc. Sample swing programs

Course Outcome:

At the end of this course student will:

CO1:Understand how object-oriented concepts are incorporated into the Java programming language
CO2: Develop problem-solving and programming skills using OOP concept
CO3:Understand the benefits of a well structured program
CO4:Develop the ability to solve real-world problems through software development in high-level programming language like Java
CO5:Develop efficient Java applets,threading and applications using OOP concept

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

Course Outcomes	Program OutComes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1		M		M	H				M		H		M	H	
CO2	L		M		H		L	L		M		M		H	M
CO3		M		H	M	L		L		M	H		M	H	
CO4			H	M			L		M		H		M	H	
CO5			H	M		L						M	H	H	

H = Highly Related; M = Medium L = Low

References:

1. Programming with Java A Primer, E.Balaguruswamy Tata McGraw Hill Companies
2. Java Programming John P. Flynt Thomson 2nd
3. Java Programming Language Ken Arnold Pearson
4. The complete reference JAVA2, Herbert schildt. TMH

BAS011E	Engineering Chemistry	3-0-0

Objectives of Chemistry

1.The purpose of this course is to emphasize the relevance of fundamentals and applications of chemical sciences in the field of engineering.

2.The courses have been conceived in such a way that they take into account appropriate combinations of old and new emerging concepts in the chemical sciences area and their current and potential uses in engineering.

3.The Course attempt to address the principles of general chemistry and specific topics relevant to various engineering disciplines, wherein the students can apply this learning in their respective areas of expertise.

UNIT 1	**Water and Analysis :** Types of impurities in Water, Hardness of Water, Disadvantages of Hard Water, Temporary and Permanent hardness. Units and inter conversions of Units. Estimation of hardness by EDTA Methods.. Methods of Treatment of Water for Domestic Purposes - Sedimentation, Coagulation, Filtration, Disinfection, Sterilization, Chlorination, Break point chlorination, Ozonization. Water for Industrial purpose, Water for Steam Making-Boiler Troubles, Carry Over, Priming and Foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement. **Water Treatment:** Internal Treatment methods, Colloidal, Phosphate, Calgon, Carbonate, Sodium aluminate Conditioning of Water. External Treatment methods, Lime-Soda Process, Zeolite Process, Ion- Exchange Process, Numerical Problems on EDTA Methods and Lime-Soda process.
UNIT 2	**Fuels :**Classification of Fuels, Calorific value,Determination of calorific value of a solid and liquid fuel, Bomb & Boy's Gas Calorimeter, Carbonization, Beeheive Oven Method, Ottohaffman's Byproduct Method, Petroleum,Cracking- fluidized catalytic cracking. Reformation of petrol, Knocking, Octane number, Cetane number, Synthetic petrol, Bergius process and Fischer-Tropsch process. **Lubricants:** Principles and function of lubricants - Types of Lubrication and Mechanism -Thick Film or Hydrodynamic Lubrication, Thin Film or Boundary Lubrication, Extreme Pressure Lubrication. Classification and properties of lubricants-Viscosity, flash and fire point, cloud and pour point, aniline point and Neutralization Number, Precipitation No.
UNIT 3	**Electrochemistry and Corrosion** Electrochemical Cell, EMF of Cell, Electrode potential. Electrochemical Series. Chemical (Dry) and Electrochemical(Wet) corrosion. Types of corrosion; stress corrosion, stress cracking, water line corrosion, bimetallic corrosion etc. Factors affecting corrosion, Protection from corrosion, Protective coatings, cathodic protection, sacrificial Anodic protection and modification in designs.

UNIT 4	**Nano particles& New engineering materials:** Terminology- scales of nano-systems- nanoparticles: introduction-atoms to molecules-quantum dots-shrinking of bulk materials to quantum dots. Different types of nanoparticles. Various approaches in nanoparticle synthesis Characterisation of nanomaterials : Important methods for the characterisation of nanomaterials Applications of nanomaterials :Catalysis, Electronics & Telecommunication, Medicines, Composites, Energy sciences Molecular electronic devices, An Introduction to polymers for electronic industry, Organic conducting polymers
UNIT 5	**Principles and Concepts of Green Chemistry**: Sustainable development, atom economy, reducing toxicity. Waste: production, problems and prevention. Green Synthesis and Catalysis; Environmentally benign processes,Green oxidation and photochemical reactions, Microwave and Ultrasound assisted reactions. Water as a reaction medium. Green chemistry in material science, synthesis of porous polymers, green nanotechnology. Green energy sources, efficiency and sustainability, energy from biomass and solid waste, Biofuels, alcohol, hydrogen production technology, biofuels from Jatropa. Industrial case studies.

Suggested Books

1. Engineering Chemistry by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co, New Delhi (2004)
2. B.K. Sharma, "Engineering Chemistry", Krishna Prakasam Media (P) Ltd., Meerut, 2001.
3. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi(15 Ediction) (2006).
4. An introduction to Electrochemistry by Samuel Glasstone,Affiliated east west press private Ltd.
5. C. N. R. Rao and A.Govindraj, Nanotubes and Nanowires, Royal Society of Chemistry
6. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd. 2007.
7. Text book of Engineering Chemistry by Shashi Chawala, Dhanpat Rai Publishing Company, 15th edition New Delhi (2004).
8.Green Chemistry: An Introductory Text: Edition 3 Author: Mike Lancaster

Course outcome

CO-1 Students will be able to explain the impurities of water (mainly hardness) and boiler troubles and also different methods to remove hardness of water.

CO-2 Students will be able to analyze the basic knowledge of various types of Fuels, Lubricants their properties and Industrial Applications.

CO-3 Students will be able to understand relate electrochemistry and corrosion.

CO-4 Students will be able to understand about different types of nano materials and polymers

CO-5 Students will be able to understand the basic concept of Green chemistry and its emrging applications in Industries and for protection of environment.

Engineering Chemistry Lab

BAS015B	Chemistry Laboratory	0-0-2

List of Experiments

1.Determination of cell constant and conductance of solutions.

2.Calibration of pH meter and determination of pH of a solution

3. Identification of a drugs using thin layer chromatography (TLC) and Column chromatography

4. Estimation of total hardness of water-EDTA method

5.Estimation of dissolved oxygen by Winkler's method

6.Estimation of chloride in water

7. Estimation of fluoride content in water by SPANDANS method

8.Determination of the viscosity of a lubricating oil by using Redwood viscometer

9.Determination of the Flash & Fire point of a lubricating oil by using Pensky Martin's apparatus

10.Determination of the Cloud& pour point of a lubricating oil

11.Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution

12. Flame photometric estimation of Na^{+} to find out the salinity in sand

13.Synthesis of polymers (a) Urea-formaldehyde resin (b) Phenol-formaldehyde resin and their characterization

14.Adsorption of acetic acid on charcoal and Isotherm study

15. Preparation of Biodiesel from vegetable oil

Suggested Books

1. Text book of Engineering Chemistry Practicals by Shashi Chawala, Dhanpat Rai Publishing Company, 15th edition New Delhi (2004).
2. Vogel's text book for quantitative analysis
3. Vogel's text book for qualitative analysis

Semester-II

Cultural Education II

Common to all disciplines
Contact Hours (L-T-P): 2-0-0

L-T-P	Cultural Education II	Credits 2-0-0 2

Objectives

1. To make the students feel gratitude towards the rich religious and cultural heritage of India.
2. To understand the role of great personalities and movements in the progress of India.

Course Outcomes (CO):

At the end of this course students will have:

CO1: Ability to acknowledge and appreciate the richness of Indian Culture
CO2: Ability to represent the culture ethics in real life

UNIT-I Holy Scriptures-II

1. Bhagavad Gita and Life Management
2. Highlights of Indian Scriptures - Major Incidents and terms from various religious scriptures including Ramayana, Mahabharta, Guru Granth Saheb, Bible, Quran, Jain Scriptures, Bodh Scriptures
3. Historicity of Ramayana and Mahabharata

UNIT-II Society and Culture-II

4. Indian Society: Its Strengths and Weaknesses
5. Health and Lifestyle related issues
6. Conservation of cultural heritage

UNIT-III India in Progress-II

7. Role & Position of Women in Indian Society- Rituals like Sati, Dakin, Kanyavadh, Pardah, Devdasi, Child Marriage, Measures of Women Empowerment including Education, Constitutional and other Rights
8. Indian Models of Economy, Business and Managemen0t

UNIT-IV Great Indian Personalities-II

9. Life and works of the Great People of India- Raja Ram Mohan Roy, Swami Vivekananad, Madan Mohan Malviya, IshwarchandVidyaSagar, JyotibaPhule, HomiBhabha, B.R. Ambedkar, Mahatma Gandhi, Chandra Shekhar Aazad, Abdul Hamid, Badshah Khan, Bhagat Singh, Ashfaqullah, Vir Sawarkar, Vir Banda Bahadur, Vir Haqiqat Rai, Subhash Chandra Bose, Mother Teresa, Jagdish Chandra Basu, JRD Tata, Ratan Tata, Dada Saheb Phalke, Major Dhayan Chand, A P J Abdul

Kalaam, Kailash Satyarthi, Aruna Roy, Mahasweta Devi, Udaya Kumar, Narayan Murthy, Azim Premji

*****Each student shall write a detailed Report/ Critique on one topic from section -A to C and one Great Personality from Section- D leading to publication of Newspaper/ Magazine article or a review paper in a Research Journal. In addition to s/he will be required to make a Power Point Presentation on the learning and face Viva-voce by a committee of teachers.

Suggested Reading:

1. Glory of Indian Culture (English) Paperback byGiriraj Shah

2. Historicity of Vedic and Ramayan Eras: Scientific Evidences from the Depths of Oceans to the Heights of Skies by SarojBala , Kulbhushan Mishra

References

https://knowindia.gov.in/culture-and-heritage/lifestyle-values-and-beliefs.php

Non Credit Course

BCE051A	**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

DEPARTMENT OF LAW ; JECRC UNIVERSITY

RECOMMENDED SYLLABUS FOR B TECH FIRST YEAR

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

BCO 011A	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 encoding - Digital and analog data. Data communication interface - asynchronous and synchronous transmission, Data link layer - Flow control. Error detection and error control. HDLC and other data link protocols. Multiplexing – Frequency-division, synchronous time-division, and statistical time-division multiplexing
UNIT 2	Link Layer:Medium Access Control: CDMA, ALOHA, and Ethernet; Link Layer Addressing and Forwarding; Spanning Trees; The Channel Allocation Problem, Multiple Access Protocols, Ethernet, Wireless LANs, Broadband Wireless, Bluetooth, Data Link Layer Switching, Switched networks. Circuit-switched networks, switching concepts, Routing incircuit-switched networks. Control signaling. Packet switching principles. Routing and congestion control
UNIT 3	Network Layer: Network layer design issues. Routing algorithms , Flooding, Shortest path routing, Link Sate routing, Hierarchical routing, Broadcast and multicast routings, Routing in the Internet, Path Vector routing, OSPF routing. 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, Intra-Domain Routing: Distance-Vector, Intra-Domain Routing: Link- State, 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.

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

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)

BCO 002B	**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's algorithm , 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		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
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).

BAS 007B	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.
- Tosolve 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 and thereby concluding that no mistake has been done in studying this course.
CO3: Gaining of some confidence on how to deal with problems which may arrive in computer science and engineering in near *future*.

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	PS O1	PS O2	PS O3
CO1	L		H		M						L				
CO2		H		H								M	M		
CO3								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.

BCO 008B	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.

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	PS O1	PS O2	PS O3
CO1	H			M				L			L		H		L
CO2		M	L						M					M	
CO3			M		M									M	M
CO4	M		L									L			

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

	Introduction to Data Science	3-0-0 [3]

Objective

- This course introduces the scope of data science and analytics. Statistical fundamentals required for data science are introduced. Overview of tools for data science is given. Data science project life cycle is discussed. Exploratory Data Analysis and the Data Science Process are illustrated.

Course Outcomes

After completing this course, the students will be able to

- CO1: Understand and describe the role of data science and its tools.
- CO2: Understand and describe the role of big data and cloud computing in data science.
- CO3: Apply mathematical and statistical principles to the analysis of data.
- CO4: Apply the techniques of Exploratory Data Analysis.
- CO5: Apply correlations, distributions and hypothesis tests for inference.

UNIT 1	Introduction - Overview of Data Science – Data Science roles – Career paths – Applications – Types of Analytics -Big data and its role in Data Science – Overview of Big data frameworks – Data science and cloud computing – role of cloud – cloud infrastructure - Essential Statistics for Data Science: Sampling, Sample Means and Sample Sizes - Descriptive statistics: Central tendency, dispersion, variance, covariance, kurtosis, five point summary.
UNIT 2	Hypothesis testing (null and alternative hypotheses), Confidence intervals, p-values and significance levels, Type I and Type II errors, Sampling and Sampling Distributions: Simple random sampling, Stratified sampling, Sampling distributions of sample statistics (e.g., sample mean, sample proportion)
UNIT 3	Parametric and Non-parametric Tests: t-tests (independent samples, paired samples), Analysis of variance (ANOVA), Chi-squared tests, Wilcoxon signed-rank test, Mann-Whitney U test, Kruskal-Wallis test, KolmogorovSmirnov test
UNIT 4	Introduction and overview of Data Science tools – Python, R, SQL – Data science project life cycle - Data Pre-processing: Data cleaning, Data reduction, Data transformation, Data discretization - Datasets and their role in analytics – EDA - Role of Visualization and Graphing – Introduction to Visualization tools
UNIT 5	Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process – Correlation - Randomness and Probability – Distributions – Hypothesis Test and inference

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	L		L			L	M								L

H = Highly Related; M = Medium L = Low

Text Books:

- Fundamentals of Software Engineering – Carlo Ghezziet. Et.al.
- Software Engineering – Design, Reliability Management – Pressman.
- Bob Hughes, Mike Cotterell, “Software Project Management”, Tata McGraw Hill. (2009)

Reference Books:

- Software Engineering – Ian Sommerville.
- Software Engineering - Shoeman.
- Software Engineering with Abstraction – Berzins and Luqi
- Pankaj Jalote, Software Engineering, Wiley.
- Royce, “Software Project Management”, Pearson Education. (2005).
- Robert K. Wysocki, “Effective Software Project Management”, Wiley.(2006)

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 operations
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 AND PROGRAM SPECIFIC OUTCOMES:

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

H = Highly Related; M = Medium L = Low

BCO 005B	DATA STRUCTURE AND ALGORITHMS LAB	0-0-2 [1]

List 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:

Having successfully completed this course, the student will be able to:

CO1: Apply knowledge of computing and mathematics to choose the data structures that effectively model the information in a problem.

CO2: Solve problems by using iterative and recursive methods

CO3: Write various operations like searching, sorting, insertion, deletion, traversing etc. on different data structure.

CO4: Apply programming concepts to solve different problems based on data structures.

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	PO 10	PO 11	PO 12	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

BCO 081A	PROGRAMMING WITH PYTHON	3-0-1 [3]

OBJECTIVE:

- To study various core programming basics—including data types, control structures, algorithm development,
- To overview the applications of Python.
- To be familiar with program design with functions—via the Python programming language.
- Students will solve problems, explore real-world software development challenges, and create practical and contemporary applications

UNIT 1	**Introduction:** Features of Python, History of Python, installing Python; basic syn interactive shell, editing, saving, and running a script. The concept of data ty variables, assignments; immutable variables; numerical types; arithmetic operators expressions; comments in the program; understanding error messages
UNIT 2	Introduction to Operators, Control statements: if-else, loops (for, while); short-cir (lazy) evaluation. **Strings:** subscript operator, indexing, slicing a string, String methods & operati strings and number system: converting strings to numbers and vice versa. Binary, o hexadecimal numbers. **Text files;** manipulating files and directories, os and sys modules; reading/writing and numbers from/to a file; creating and reading a formatted file
UNIT 3	**Lists, tuples, and dictionaries**; basic list operators, replacing, inserting, removing element; searching and sorting lists; dictionary literals, adding and removing k accessing and replacing values; traversing dictionaries. **Design with functions:** hiding redundancy, complexity; arguments and return val formal vs actual arguments, named arguments. Program structure and design. Recur functions.
UNIT 4	**Classes and OOP:** classes, objects, attributes and methods; defining classes; design v classes, data modeling; persistent storage of objects **OOP, continued:** inheritance, polymorphism Operator overloading (_eq_, _str_, etc); abstract classes; Exception handling, try block
UNIT 5	**Graphical user interfaces;** Event-driven programming paradigm; tkintermodule,,tu module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attribut sizes, fonts, colors layouts, nested frames Multithreading, CSV(Accesing, updat Creating)

Course Outcome*:*
Upon completion of this course, the student will be able to:

CO1: Understand different core programming basics—including data types, control structures, algorithm development,
CO2: Understand the applications of Python.
CO3: Show the program design with functions—via the Python programming language.
CO4: Students will solve problems, explore real-world software development challenges, and create practical and contemporary 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										H		
CO2		L			M									L	L
CO3			H		M						L		M		L
CO4		M		L					L	L				M	

H = Highly Related; M = Medium L = Low

Text Book:

1. *Fundamentals of Python: First Programs* Author: Kenneth Lambert Publisher: Course Technology, Cengage Learning, 2012 ISBN-13: 978-1-111-82270-5

Reference Books:

1. Python: Real World Machine LearningBy Prateek Joshi et al.ISBN 13: 9781787123212 Packt Publishing 941 pages (November 2016)

B.Tech CSE Semester IV

BCO 009B	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 Spe Outcome**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	H											M	H		
CO2			H		M									M	
CO3				M					M				L		
CO4				H						M			M		
CO5				H						M					

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

.BCO 010C	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 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 3	Relational Database Design- Functional Dependencies, Multi-valued Dependencies, Normal Forms, Decomposition into Normalized Relations.
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 Spec Outcome	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H												H	M
CO2			H		M				M					
CO3				H		M							M	
CO4				M								M		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 019A	ARTIFICIAL INTELLIGENCE	3:0:0

Course Objective:

- To explain the basic principles of artificial intelligence
- To apply logic and structured concepts in knowledge representation and discuss the applications of artificial intelligence
- To implement and analyze Uninformed and Informed Search Strategies
- To implement and apply various game playing Algorithms to different problems
- Understand and represent various types of logics and their forms
- To Understand and various Learning techniques and analyze concept of ANN

UNIT 1	**Introduction**- What is intelligence? Foundations of artificial intelligence (AI), Task of artificial intelligence, Techniques of artificial intelligence, Problem Solving Formulating problems, problem types, states and operators, state space. Knowledge Representation- Role of Knowledge, Declarative Knowledge, Procedural Knowledge, Knowledge representation Techniques; conceptual graphs; structured representations; frames, scripts; issues in knowledge representation **Morden terminologies: AI Hallucination,Deepfake, Explainable AI, Generative AI, Responsible AI, Sentient**
UNIT 2	**Uninformed & Informed Search Strategies**- Breath First Search, Depth First Search, Depth Limited Search, Heuristic Functions, Best First Search, Hill Climbing Algorithm, Problems and solutions of Hill Climbing, Iterative Deepening (IDA), A* algorithm, AO* Algorithm
UNIT 3	**Game playing**- Introduction, Types of games, Minimax game algorithm, Alpha Beta cut-off procedure , Jug problem, Chess problem, Tiles problem
UNIT 4	**Logics- P**ropositional logics, First Order Predicate Logics (FOPL), Syntax of First Order Predicate Logics, Properties of Wff, Clausal Forms, Conversion to clausal forms
UNIT 5	**Learning-** Overview of different forms of learning, Supervised base learning, Unsupervised based learning, Introduction to Neural networks:- basic, comparison of human brain and machine, biological neuron, general neuron model, Basic Architecture of Neural Networks, Single Computational Layer: The Perception, Choice of Activation functions, Number of Output Nodes and Loss Functions, applications and advantages of neural networks. Brief introduction to single layer and multiplayer networks

Course Outcomes: Upon the end of this course, student will be:

CO1: Familiar with the basic principles of artificial intelligence

CO2: To implement and analyze uninformed and informed Search algorithms

CO3: Able to represent and apply various logics and structured concepts in knowledge representation

CO4: To implement and apply various game playing algorithms to different problems

CO5: To Understand various Learning techniques and concept of ANN

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

Course Outcome	**Program Outcome**												**Program Specific Outcome**		
	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2	PSO3
CO1	H	L	L	M	H	L			M		L	H	L		
CO2	H	H	H	M	H	L			H	M	M	H	M		
CO3	H	M	M	H	H	L	L	L	M	M	M	H	M	M	H
CO4	H	M	M	H	H	L	L	L	H	M	M	H	H	M	H
CO5	H	L		L	M	L			M		L	H	L		M

H = Highly Related; M = Medium L = Low

Text Books:

1. Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson Education Press, 2001.

2. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.

3. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (INDIAN EDITION), 2013.

Reference Books:

1. George F. Luger, Artificial Intelligence, Pearson Education, 2001.

2. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002.

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

H = Highly Related; M = Medium L = Low

Artificial Intelligence Lab

Prerequisite: NiL **Lab Hours:** 2

1	Uninformed Search Algorithms in Artificial Intelligence:	I. Depth First Search (DFS) Problem: Implement the distinct island problem using Depth First Search (DFS) II. Breadth First Search (BFS) Problem: Implement water jug problem using Breadth First Search (BFS)
2	Informed Search Techniques:	Implement 8-Puzzle Problem using Hill Climbing II. Implement 8-Puzzle Problem using Best First Search. III. Implement Tic Tac Toe using Minimax algorithm. IV. Implement 8 Queens Problem with Best First Search V. Implement 8-puzzle problem using A* Algorithm VI. Implement N-Queens problems VII. Define a model (PEAS) for a Wumpus world and solving it.
3	Constraint Satisfaction Problem:	Implement Crypt Arithmetic Problem. Model finding and applying inference algorithms like forward and backward chaining.

References

1. Artificial Intelligence: A Modern Approach by Russel and Norvig, Third Edition, Pearson, 2015.
2. Artificial intelligence: Concepts and Applications: Lavika Goel, Wiley Publications, 2021.
Link:https://www.amazon.in/Artificial-Intelligence-Applications-Lavika-Goel/dp/8126519932

3. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
4. Introduction to AI & Expert System: Dan W. Patterson, PH

B.Tech. CSE Semester V

BCO 017A	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	Basics of Strings and Alphabets, Finite Automata – DFA, transition graphs, regular languages, non-deterministic FA, equivalence of DFA and NDFA, Mealy and Moore Machine, minimization of Finite Automata,
UNIT 2	Regular grammars, regular expressions, equivalence between regular languages, properties of regular languages, pumping lemma. Relationship between DFA and Regular expression.
UNIT 3	Context Free Languages – Leftmost and rightmost derivation, parsing and ambiguity, ambiguity in grammar and languages, simplification of CFG, Normal forms
UNIT 4	Pushdown Automata – NDPDA, DPDA, context free languages and PDA,comparison of deterministic and non-deterministic versions, closure properties, pumping lemma for CFL,
UNIT 5	Turing Machines, variations, halting problem, PCP, Chomsky Hierarchy, Recursive and Recursive enumerable language, Rice Theorem.

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 Speci Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
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.

BCO 023A	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, algorithms specification, time and space complexity, performance analysis, recurrence relations. Divide and Conquer – finding max min.
UNIT 2	Dynamic Programming and Greedy Methods – Huffman tree construction, Knapsack problem, 0/1 Knapsack problem,least common subsequence**,** matrix chain multiplication. Backtrack: 4-queen problem, Branch and Bound: assignment problem
UNIT 3	Graph algorithms–flow problems, String Matching Algorithms: Naive algorithm, automata and KMP matcher algorithms, Boyer-Moore algorithm
UNIT 4	Number Theory Problems – CRT, GCD algorithms, modular arithmetic, Lower Bound Theory; 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 thebest 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 Speci Outcome**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	H	H	M		M			M				L	H	M	
CO2	H	H			H							L	H	M	
CO3	M	H	L		M			M				M			
CO4	H	L	M		M							L	M	H	
CO5	H	M	M		M			L				L	M	M	

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 007A	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	**Introduction to Computer Graphics:**Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices,Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video Basics, The Video Controller, Random-Scan Display Processor, LCD displays.
UNIT 2	**Scan conversion – lines, circles and Ellipses; Filling polygons and clipping algorithms:**Scan Converting Lines, Mid-point criteria, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Scan Converting Ellipses, Filling Polygons, edge data structure, Clipping Lines algorithms Cohen-Sutherland and Liang-Barsky, Clipping Polygons, problem with multiple components.
UNIT 3	.**Two-Dimensional Transformations:**Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined Transformation, Transformation of Points, Transformation of The Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations.
UNIT 4	**Three-Dimensional Transformations:**Introduction, Three-Dimensional Scaling, Three-Dimensional Shearing, Three-Dimensional Rotation, Three-Dimensional Reflection, Three-Dimensional Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections
UNIT 5	**Visible-Surface Determination :**Techniques for efficient Visible-Surface Algorithm Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line metho Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visibl Surface Ray Tracing, comparison of the methods. **Illumination and Shading** Illumination and Shading Models for Polygons, Reflectan properties of surfaces, Ambient, Specular and Diffuse reflections, Atmospher attenuation, Phong's model, Gouraud shading, some examples.

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

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND 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	L								M		
CO2			M	L					L		L			L	
CO3			L		L						M	L	L		
CO4			H							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 086B	MACHINE LEARNING	3-0-1 [4]

Course Objectives

- To understand the basic concepts of learning and decision trees.
- To understand the neural networks and genetic algorithms
- To understand the Bayesian techniques
- To understand the instant based learning
- To understand the analytical learning and reinforced learning

UNIT 1	INTRODUCTION, CONCEPT LEARNING AND SUPERVISED LEARNING ALGORITHMS: Introduction, Types of learning, Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm , Linear Regression Model, Naïve Bayes Classifier, Decision Tree, K Nearest Neighbor, Logistic Regression, Support Vector Machine, Random Forest Algorithm.
UNIT 2	UNSUPERVISED LEARNING ALGORITHM: Clustering- K-means Clustering, Hierarchical Clustering, Probabilistic Clustering, Apriori Algorithm, Association Rule Mining, Gaussian Mixture Model, Expectation Maximization. ENSEMBLE LEARNING-Bagging, Boosting and Stacking
UNIT 3	REGULARIZATION- Overfitting, Underfitting, Bias-Variance trade off, Cost Function, Regularized Linear Regression and Regularized Logistic Regression, Model Selection and train/Validation/Test Sets, VC Dimension. STATISTICAL LEARNING- Feature Extraction, Principal Component Analysis, Singular Value Decomposition, Feature Selection and subset selection.
UNIT 4	NEURAL NETWORKS AND GENETIC ALGORITHMS Neural Network Representation – Problems – Perceptron – Multilayer Networks and Back Propagation Algorithms – Gradient Descent.
UNIT 5	ANALYTICAL LEARNING AND REINFORCED LEARNING Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning- Markov Decision Processes (MDP), Introduction to Natural Language Processing and Recommended System- Collaborative and Content based Filtering.

Course Outcome:

CO1. Choose the learning techniques with this basic knowledge.

CO2. Apply effectively neural networks and genetic algorithms for appropriate applications

CO3. Apply Bayesian techniques and derive effectively learning rules.

CO4. Choose and differentiate reinforcement and analytical learning techniques

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	M	M											M	M	
CO2	H	H	H	H	H								M	M	
CO3	H	H			M									M	
CO4	H	H	H	H	M									M	

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

Required Texts:

1. Machine Learning, Tom Mitchell, McGraw Hill, 1997, ISBN 0-07-042807-:
2. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (INDIAN EDITION), 2013.

REFERENCES:

1. EthemAlpaydin, "Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd., 2013.
2. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.

	DATA MINING AND WAREHOUSING	3-0-0

Course objectives

- Understand the process of Data mining and predictive analytics
- Compare and contrast the underlying predictive modelling techniques.
- Apply predictive modelling approaches using a suitable packages
- Identify the basic concepts and the importance of model development and evaluation techniques.
- Develop data analysis and modelling through tools like SPSS/MINITAB/R

UNIT1	**Introduction and Overview of the Data Mining & Predictive Analytics** : Introduction, The Cross-Industry Standard Process for Data Mining, analysis and methodologies , Fallacies of Data Mining, data mining tasks, Dimension reduction methods,
UNIT2	**Data Understanding and Preparation**: Introduction, Reading data from various sources, Data visualization, Distributions and summary statistics, Relationships among variables, Extent of Missing Data. Segmentation, Outlier detection, Automated Data Preparation, Combining data files, Aggregate Data, Duplicate Removal, Sampling DATA, Data Caching, Partitioning data, Missing Values.
UNIT3	**Predictive Modelling Techniques**: Simple Linear Regression, Multiple Linear Regression and model building, Logistic Regression and diagnostics Classification Algorithms and Ensemble Methods, Discriminant Analysis, Logistic regression for classification, Decision trees, Ensemble methods: Bagging and Boosting, Naïve Bayes.
UNIT4	**Model development** : Model selection, Model Development Techniques, Model Evaluation Techniques ,Neural networks, Decision trees, Support vector machine, Bayesian Networks, , Association rules, Sequence Detection, Which Technique to use when and in which application
UNIT 5	**Model Evaluation**: Model Evaluation Techniques for Prediction and classification Tasks ,Model Validation, Rule Induction Using CHAID, Automating Models for Categorical and Continuous targets, Comparing and Combining Models, Evaluation Charts for Model Comparison, Meta Level Modelling, Deploying Model, Assessing Model Performance, Updating a Model.

COURSE OUTCOMES

CO1. Understand and recognize the process of Data mining & predictive analytics
CO2. Compare and contrast the underlying predictive modelling techniques.
CO3. Identify and select appropriate predictive modelling techniques for particular application
CO4. Develop and evaluate predictive data model using different modelling tools

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	H										H	M	M	
CO2	H	H		H	H							H	M	M	
CO3	H	H	H		M							H		M	
CO4	H	H	H	H	M									M	

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

Text Books

1. Larose, D.T. and Larose, C. D., Data Mining and Predictive Analytics, Wiley.
2. Shumeli, G., Bruce, P.C., Yahav, I., Patel, N.R. and Lichtendahl, K.C. Jr., Data Mining for Business Analytics, Wiley.
3. Kumar, D. U., Business Analytics-The Science of Data-Driven Decision Making, Wiley.
4. Kabacoff, R. I., R in Action: Data Analysis and Graphics with R, Dreamtech Press. Crawley, M. J., The R-Book, Wile
5. Data Mining & Predictive Modeling (IBM ICE Publications).

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. Write 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 Specif Outcome		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
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 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

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

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

H = Highly Related; M = Medium L = Low

BCO 089 B	MACHINE LEARNING LAB	0-0-2 [2]

Course Outcomes

CO1. To implement regression and various learning algorithms
CO2. Implement various classifiers and amalyze those classifiers base on confusion matrix
CO3. pattern recognition and machine learning theories
CO4. To design neural network and test network for different dataset
CO5. To apply the ML theories to different applications like face

List of Experiments

Lab 1. Implement the CANDIDATE – ELIMINATION algorithm. Show how it is used to learn from training examples.

Lab 2. Write a program to implement Linear Regression and Logistic Regression

Lab 3. Implement the ID3 algorithm for learning Boolean–valued functions for classifying the training examples by searching through the space of a Decision Tree.

Lab 4. Design and implement Naïve Bayes Algorithm for learning and classifying TEXT DOCUMENTS.

Lab 5. Implement K-Nearest Neighbor algorithm to classify the iris data set. Calculate the score also.

Lab 6. Write a program to implement Support Vector Machine. Also discuss the confusion matrix and score of model.

Lab 7. Apply EM algorithm to cluster a set of data and also apply K-Means algorithm on the same data set to compare two algorithms.

Lab 8. Build an Artificial Neural Network by implementing Back-Propagation algorithm and test the same using appropriate data set.

Lab 9. Implement the Non-Parametric Locally Weighted Regression Algorithm in order to fit data points. Select appropriate data set for your experiment and draw graph.

Lab 10. Build a Face detection system to recognize faces in a frame or image. You can use OpenCV for this task.

B.Tech. CSE Semester VI

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	PO 10	PO 11	PO 12	PSO 1	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.

	ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING	3-0-1

Course Objectives

- The main objective of this course is to provide the student with the basic understanding of neural networks fundamentals,
- Program the related algorithms and Design the required and related systems
- To evaluate the performance of neural architectures in comparison to other machine learning method
- To understand the concepts of deep Learning neural networks
- Discuss Convolution Neural Network models to Applications

UNIT1	**Introduction to Artificial Neural Network :** Introduction and ANN Structure, Biological neurons and artificial neurons, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear separability, Type of network architecture, Activation functions, Basic Learning rules, Model of an ANN. Activation functions used in ANNs. Typical classes of network architectures.
UNIT2	**Single Layer Perceptrons**: Structure and learning of perceptrons, Pattern classifier, introduction and Bayes' classifiers, Perceptron as a pattern classifier, Perceptron convergence. Limitations of a perceptrons. **Feed forward Networks:** Multilayer Neural Network, Gradient Descent learning, Back propagation, Empirical Risk Minimization, regularization, Radial Basis Neural Network bias-variance trade off, regularization - over fitting - inductive bias regularization - drop out - generalization
UNIT3	**Radial Basis Function Networks**: Pattern separability and interpolation, Regularization Theory Regularization and RBF networks, RBF network design and training. Approximation properties of RBF.
UNIT4	**Introduction to Deep Learning and its Applications**. Convolutional Neural Networks: Convolution, pooling, Activation Functions, Back propagation of CNN, Weights as templates, Translation invariance, Training with shared parameters. CNN Architecture Design and Discussion: AlexNet, VGG, GoogLeNet, ResNet, Capsule Net, etc. Visualization and Understanding: Visualizing intermediate features and outputs, Saliency maps, Visualizing neurons, Cam-Grad, etc.
UNIT 5	Deep Learning Applications: Object Detection: RCNN, Fast RCNN, Faster RCNN, YOLO and variants, Retina Net, etc., Adversarial Attacks on CN. Deep learning Libraries and Frameworks:

Text Books

1. Simon Haykin, “Neural Networks, A Comprehensive Foundation”, 2nd Edition, Addison Wesley Longman, 2001.
2. Bishop, Christopher M. Pattern Recognition and Machine Learning. Springer, 2006
3. Charu C.Aggarwal “Neural Networks and Deep learning” Springer International Publishing, 2018
4. Satish Kumar, “Neural Networks, A Classroom Approach”, Tata McGraw -Hill, 2007.

Course Outcomes

CO1. Explain &Demonstrate the basic concepts in Neural Networks and applications
CO2. Explain Feed forward, multi-layer feed forward networks and Back propagation algorithms
CO3. Analyze Radial Basis Function Networks, Theory Regularization and RBF network
CO4. Discuss & Apply Convolution Neural Network models to applications
CO5. Analyse various deep networks applications and tools and analyze their tools

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							M			
CO2	M	L										M	M	M	
CO3	H	M	M		M							H			
CO4	H	M	M	M	M							H			
CO5	H	M	M	M	M							H	M	M	

	ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING**Lab**	**0-0-2**

Course Objectives

1	• Basic perceptron Perceptron learning • Multi layer feed forward neural networks • Hopfield model for pattern storage task • Competitive learning neural networks for pattern clustering • Solution to travelling salesman problem using self organizing maps • Solution to optimization problems using Hopfield models
2	Implement KNN, using 3 layer neural network
3	Familiarization of image labelling tools for object detection, segmentation
4	Object detection with single-stage and two-stage detectors (Yolo, SSD, FRCNN, etc.)
5	Deep learning Libraries and Frameworks:

Text Books

Course Outcomes

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

Course Outcome	**Program Outcome**												**Program Specific Outcome**		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PS

	1	2	3	4	5	6	7	8	9	0	1	2	1	2	O3
CO1															
CO2															
CO3															
CO4															

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.

B.Tech. VIII semester

BCO 230 A	Big Data Analytics using R	3-0-2

Pre- requisites : Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

COURSE OBJECTIVES :

1. Understand the Big Data Platform and its Use cases
2. Provide an overview of Apache Hadoop
3. Provide HDFS Concepts and Interfacing with HDFS
4. Understand Map Reduce Jobs
5. Provide hands on Hodoop Eco System
6. Apply analytics on Structured, Unstructured Data.
7. Exposure to Data Analytics with R.

UNIT 1	**INTRODUCTION TO BIG DATA AND HADOOP :**Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.
UNIT 2	**HDFS(Hadoop Distributed File System)** The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.
UNIT 2I	**Map Reduce** Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.
UNIT 4	**Hadoop Eco System** **Pig :**Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. **Hive :** Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. **Hbase :**HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. **Big SQL :** Introduction
UNIT 5	**Data Analytics with R**

	Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

COURSE OUTCOMES:

The students will be able to:

CO1 Identify Big Data and its Business Implications.

CO2 List the components of Hadoop and Hadoop Eco-System

CO3 Access and Process Data on Distributed File System

CO4 Manage Job Execution in Hadoop Environment and Develop Big Data Solutions using Hadoop Eco System

CO5 Analyze Infosphere BigInsights Big Data Recommendations and Apply Machine Learning Techniques using R.

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

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

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

Text Books

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.

2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

References

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.

Digital Image Processing

BCO 195A	Digital Image Processing	**3-0-1**

Course Objective

Module 1:	Introduction to Digital Image Processing: Digital Image Representation, Fundamental Steps in DIP, Elements of Visual Perception, Image Sensing and Acquisition, Image Model, Sampling, Quantization, Basic Relationship Between the Pixels
Module 2:	Image Transforms: Discrete Fourier Transform (DFT), Properties of 2D DFT, Fast Fourier Transform, Inverse FFT, Discrete Cosine Transform and KL Transform, Discrete wavelet Transform, Convolution and Correlation
Module 3:	Image Enhancement: Spatial Domain- Basic Gray Level Transformations, Histogram processing, Smoothing and Sharpening Spatial Filters Frequency Domain- Smoothing and Sharpening frequency domain filters, Homomorphic filtering
Module 4:	Image Restoration: Overview of Degradation models, Unconstrained and constrained restorations, Image Segmentation: Detection of discontinuities, edge linking and boundary detection, thresholding, region oriented segmentation Representation and Description: Representation schemes, boundary descriptors, regional descriptors.
Module 5:	Image Compression: Need for data compression, image compression models, loss-less and lossy compression Morphology: Dilation, erosion, opening, closing, Hit-or-Miss Transform, some basic morphological algorithms

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson , 3rd Edition, 2008

2. Castleman. Digital Image Processing. Prentice Hall.

3. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson , 2002

Digital Image Processing Lab

Familiarization with various image processing tools

1. Basic operations on images
2. Basic grey-level transformations
3. Image Negative
4. Logarithmic transformation
5. Power-law transformation
6. Perform the following over a given image
7. Grey level slicing
8. Zooming (Nearest neighbour interpolation, bilinear interpolation)
9. Bit-plane slicing
10. Histogram equalization and specification
11. 12. Spatial filtering in presence of various noise
12. Implementation of image deblurring techniques
13. Image segmentation (edge detection, line detection, point detection)
14. Implementation of region based image segmentation
15. Implementation of different morphological operations

References

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson , 3rd Edition, 2008

2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson , 200

Big Data Analytics Lab

List of Experiments

1. Implement the following Data structures in Java

i) Linked Lists ii) Stacks iii) Queues iv) Set v) Map

2. Perform setting up and Installing Hadoop in its three operating modes:

a) Standalone, Pseudo distributed, Fully distributed.

3. Implement the following file management tasks in Hadoop:

• Adding files and directories

• Retrieving files

• Deleting files

(Hint: A typical Hadoop workflow creates data files (such as log files)

elsewhere and copies them into HDFS using one of the above command line utilities.)

4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

5. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.

6. Implement Matrix Multiplication with Hadoop Map Reduce.

7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions,

and indexes.

9. Solve some real life big data problems.

B.Tech. CSE Semester VIII

S. No.	Code	Subject	L	T	P	Contact Hrs.	Credits	Type
1	BCO 034B	Industrial Project/Dissertation	0	0	20	20	20	C
		TOTAL	**0**	**0**	**20**	**20**	**20**	