Bharati Vidyapeeth

(Deemed to be University)

Pune, India

Department of Engineering and Technology , Navi Mumbai

B. Tech CSE (AIML)

(2023 CBCS COURSE)

Program Curriculum

As Per NEP 2020 Guidelines

VISION OF THE UNIVERSITY

To be a world class University for social transformation through dynamic education.

MISSION OF THE UNIVERSITY

- To provide inclusive borderless access to higher education and vocational education based on merit.
- To offer varied professional, technical, vocational and general education programs to meet the changing and divers needs of society in a global contest.
- To provide quality higher education for liberation of mind and empowerment of hands.
- To promote quality research in diverse areas of development and engaging application of knowledge for community development.
- To develop national and international networks with industry, service sector and other academic and research institution to meet the expectation for various stakeholders.
- To promote extensive use of ICT for enrichment of teaching learning and for effective governance.
- To make quality and integral part of all university operations by promoting innovation practices.

VISION OF THE INSTITUTE

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT

- To impart quality education and produce high quality, creative and ethicalengineers and inculcate professionalism, enhance student's problem- solving skills in the domain of Artificial Intelligence and Machine Learning (AI and ML).

MISSION OF THE DEPARTMENT

- To provide skill-based education to master the students in problem solving and analytical skills to enhance their expertise in the field AI and ML.
- To educate the students with latest technologies to update their knowledge in the field of AI and ML.
- To guide students in research with aim of having an ethical impact on society by engaging in societal grand challenges.

PROGRAM EDUCATIONAL OBJECTIVES

Graduates will be able to

1. Adapt, contribute, and innovate ideas in the field of Artificial Intelligence and Machine Learning by productively engaging in research.
2. Pursue higher studies in Engineering or Management.
3. Demonstrate technical skills, competency and promote collaborative learning and team work spirit through multi -disciplinary projects and diverse professional activities.
4. Accomplish sustainable progress in the emerging computing technologies through life-long learning.

PROGRAM OUTCOMES

1. Apply knowledge of Mathematics and Computer Science to analyse computer-based information systems.

2. Apply logical and programming skills to identify, formulate and analyse for solving computational problems.

3. Examine complex problems by a diagnosis of available information to provide an appropriate conclusion.

4. Design applications with suitable consideration of societal needs.

5. Use functional skills of modern IT tools and techniques for modelling and implementation.

6. Play the role of a team player to accomplish a common goal.

7. Convey technological concepts through significant documentation and presentation skills.

8. Demonstrate professional conduct by following norms of the Engineering practice.

9. Apply Software Engineering methodologies for sustainable development.

10. Follow ethical and legal practices related to the functioning of the IT industry.

11. Apply management skills and techniques for creating time-bound and cost-effective projects.

12. Exhibit lifelong learning by upgrading to state-of-the-art IT practices and technology.

PROGRAM   SPECIFIC OUTCOMES

At the end of the program, Graduates will be able to

PSO 1: Design and develop intelligent automated systems applying mathematical, analytical, programming, and operational. skills to solve real world problems.

PSO 2: Apply machine learning techniques, software tools to conduct experiments, interpret data and to solve complex problems.

PSO 3: Implement engineering solutions for the benefit of society using AI and ML.

CORELATION BETWEEN GRADUATE ATTRIBUTES AND PROGRAMME OUTCOMES

Graduate Attributes/ Program Outcomes	a	B	C	d	e	f	g	h	i	j	k	l
Engineering Knowledge	✓											
Problem Analysis		✓										
Design/Development of Solutions			✓									
Conduct Investigations of Complex Problems				✓								
Modern Tool Usage					✓							
The Engineer and Society						✓						
Environment and Sustainability							✓					
Ethics								✓				
Individual and Teamwork									✓			
Communication										✓		
Project Management and Finance											✓	
Life-Long Learning												✓

DEFINITION OF CREDITS

1 Hour Lecture (L) per week	1 credit
1 Hour Tutorial (T) per week	1 credit
1 Hour Practical (P) per week	0.5 credits
2 Hours Practical (Lab) per week	1 credit

Course Code and Definition

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
TW	Term Work
O	Oral
SEE	Semester End Examination
MJ	Major (Core) Courses
MI	Minor Courses
GE	General Elective Courses
OE	Open Elective Courses
SE	Skill Enhancement Courses
AE	Ability Enhancement Courses
VE	Vocational Enhancement Courses
VS	Vocational Skill Courses
VA	Value Added Courses
CC	Co-curricular Courses
EC	Extra-Curricular Courses
ID	Inter-disciplinary Courses
MD	Multidisciplinary Courses
RP	Research I Project Courses
PC	Practical Courses
BS	Basic Science
ES	Engineering Science
AC	Audit Course
EC	Extracurricular Activities
BM	Basic Mathematics
BP	Basic Physics
BC	Basic Chemistry
UH	Universal Human Values

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE
B. Tech. CSE (AIML): Semester –I (2023 COURSE)

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
		L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	Engineering Mathematics- I	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	Physics for Computing System	3	2	-	60	40	25	-	-	125	3	1	-	4
3.	Electrical Technology	3	2	-	60	40	25	-	-	125	3	1	-	4
4.	Programming & Problem Solving	3	4	-	60	40	25	25	-	150	3	2	-	5
5.	Internet Programming	4	2	-	60	40	25	25		150	4	1	-	5
6.	Universal Human Values - I	-	2	-	-	-	50	-	-	50	-	1	-	1
7.	Skill based Course-I(Computer Programming – I:CSWT)	-	4	-	-	-	25	-	25	50	-	2	-	2
	Total	16	16	1	300	200	175	50	25	750	16	8	1	25

(BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE
B. Tech. CSE (AIML): Semester –II (2023 COURSE)

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
		L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	Engineering Mathematics- II	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	Organic & Electro-Chemistry	3	2	-	60	40	25	-	-	125	3	1	-	4
3.	Digital Electronics	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	Probability & Statistics	3	2	-	60	40	25	-	-	125	3	1	-	4
5.	Object Oriented Programming	4	4	-	60	40	25	25	-	150	4	2	-	6
6.	Communication Skills	-	2	-	-	-	50	-	-	50	-	1	-	1
7.	Skill based Course –II (Computer Programming -II:SSSL)-	-	4	-	-	-	25	-	25	50	-	2	-	2
	Total	**16**	**16**	**1**	**300**	**200**	**175**	**25**	**50**	**750**	**16**	**8**	**1**	**25**

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE
B. Tech. CSE (AIML): Semester –III (2023 COURSE)

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
		L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	Discrete Mathematics	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	Computer Organization and Micro Processor	3	~	-	60	40	-	-	-	100	3	-	-	3
3.	Data Structure	3	2	-	60	40	25	25	-	150	3	1	-	4
4.	Python Programming	3	2	-	60	40	25	25	-	150	3	1	-	4
5.	Database Management System	3	2	-	60	40	25	25	-	150	3	1	-	4
6.	Skill based Course –III (Computer Programming –III J2EE)	-	2	-	-	-	25	25	-	50	-	1	-	1
	Total	**15**	**08**	**01**	**300**	**200**	**100**	**100**	**-**	**700**	**15**	**4**	**1**	**20**
7.	**MOOC-I	-	-	-	-	-	-	-	-	-	-	-	-	2
8.	Intellectual Property Rights	2	-	-	-	100	-	-	-	-	-	-	-	2

**Indicate this is mandatory but the credits will not be considered in SGPA/CGPA

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE
B Tech. CSE (AIML): Semester –IV (2023 COURSE)

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
		L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	Theory of Computation	3	-	1	60	40	-	-	-	100	3	-	1	4
2	Foundation of Artificial Intelligence	3	2	-	60	40	25	25	-	150	3	1	-	4
3.	Design and Analysis of Algorithms	3	2	-	60	40	25	25	-	150	3	1	-	4
4.	Data Warehouse and Mining	3	-	-	60	40	-	-	-	100	3	-	-	3
5.	Operating Systems	3	2	-	60	40	25	25	-	150	3	1	-	4
6.	Skill based Course –IV (Advanced Python)	-	2	-	-	-	25	25	-	50	-	1	-	1
	Total	**15**	**08**	**1**	**300**	**200**	**100**	**100**	**-**	**700**	**15**	**4**	**1**	**20**
7.	Indian Knowledge System*	2	-	-	-	100	-	-	-	100	-	-	-	2
8.	Social Activity*	-	-	-	-	-	-	-	-	-	-	-	-	2

*Indicates Mandatory course

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
		L	P	T	ESE	IA	TW	PR	O R	Total	Th	Pr / O r	Tut	Total
1.	Compiler Construction	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	Machine Learning	3	2	-	60	40	25	25	-	150	3	1	-	4
3.	Software Engineering *	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	Computer Networks	3	2	-	60	40	25	25	-	150	3	1	-	4
5.	Course – 5 (PEC- I)	3	-	-	60	40	-	-	-	100	3	-	-	3
6.	Skill based Course –V (R Programming)	-	2	-	-	-	25	25	-	50	-	1	-	1
7.	Environmental Studies	4	-	-	**40 + 20	***30+ 10	-	-	-	100	4	-	-	4
	Total	**19**	**8**	**1**	**360**	**240**	**100**	**75**	**25**	**800**	**19**	**4**	**1**	**24**

*Indicate industry taught course

Professional Elective Course-I	1	2	3
	Internet of Things	Image Processing	Data Visualization

Environmental Studies:

** 1. ESE: a. 40 Marks (MCQ based end of semester/term university examination, for Units I to VIII)

            b. 20 Marks (Case Studies and Field Work report and presentation in a group, for Unit IX)

*** 2. IA: a. 30 Marks (Internation assessments comprising of   Assignments/Seminars/Class work/Tests/projects, etc, for Unit I to VIII)

          b. 10 Marks - Attendance for Unit I to VIII

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B Tech. CSE (AIML): Semester –VI (2023 COURSE)

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
		L	P	T	ESE	IA	TW	PR	O R	Total	Th	PR /Or	Tut	Total
1.	Deep Learning	3	2	-	60	40	25	25	-	150	3	1	-	4
2.	Cloud Computing*	3	2	-	60	40	25	-	25	150	3	1	-	4
3.	Big Data Analysis	3	2	-	60	40	25	25	-	150	3	1	-	4
4.	Soft Computing	3	-	-	60	40	-	-	-	100	3	-	-	3
5.	Course – 5 (PEC-II)	3	-	-	60	40	-	-	-	100	3	-	-	3
6.	Professional Skills	-	2	-	-	-	50	-	-	50	-	1	-	1
7.	Skill based Course–VI (DevOps Lab)	-	2	-	-	-	25	25	-	50	-	1	-	1
	Total	**15**	**10**	**-**	**300**	**200**	**150**	**75**	**25**	**750**	**15**	**5**	**-**	**20**
8.	**Value Added Course- II	-	2	-	-	40	-	-	-	-	-	2	-	2
9.	**MOOC – II	-	-	-	-	-	-	-	-	-	-	-	-	2

*Indicate industry taught course
**Indicate this is mandatory but the credits will not be considered in SGPA/CGPA

	1	2	3
Professional Elective Course-II	Cryptography & Network Security	Business Intelligence	Software Testing

B. Tech CSE (AIML) Semester I

Programme: B. Tech. Sem – I (2023 course)

COURSE: ENGINEERING MATHEMATICS-I

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week	Semester End Examination: 60 Marks	Credits: 4
Tutorial :- 01 Hours/ Week	Term work Internal Assessment: 40 Marks	

Course Pre-requisites: The students should have knowledge of

1.	Algebra of matrices and its Determinants, Maxima and Minima of single variable functions.

Course Objective: On completion of the course

1.	Fundamental theorems, concepts in Matrices, Demoivr's theorem and its applications in engineering.
2.	Various techniques in Calculus, Explanation of functions and Infinite series.
3.	Partial differentiation, maxima, minima and its applications in engineering.

Course Outcomes: After completion of the course students will be able to

1	Understand rank of matrix and apply it to solve system of linear equations
2	Understand the DeMoiver's theorem, hyperbolic functions and apply it in engineering problems.
3	Understand the Leibnitz's rule and apply it to find nth derivative of a function.
4	Understand fundamental concepts of convergence, divergence of infinite series and its tests.
5	Understand the concept of partial differentiation and apply it to find total derivative.
6	Evaluate the maxima and minima of any two variables functions.

Course Content:

Unit-I	MATRICES Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations, Eigen values, Eigen Vectors, Cayley – Hamilton Theorem.	(6 Hrs)

Unit-II	**COMPLEX NUMBERS AND APPLICATIONS** Definition, Cartesian, Polar and Exponential Forms, Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.	**(6 Hrs)**
Unit-III	**DIFFERENTIAL CALCULUS I** Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem. Expansion of Functions: Taylor's Series and Maclaurin's Series.	**(6 Hrs)**
Unit-IV	**DIFFERENTIAL CALCULUS II** Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits. Infinite Series: Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence	**(6 Hrs)**
Unit-V	**PARTIAL DIFFERENTIATION AND APPLICATIONS** Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables, Errors and Approximations.	**(6 Hrs)**
Unit-VI	**JACOBIAN** Jacobians and their applications, Chain Rule, Functional Dependence. Maxima and Minima: Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.	**(6 Hrs)**

Textbook:	
1.	Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune),7th Edition, 1988, Reprint 2010.
Reference Books:	
1	Higher Engineering Mathematics by B.S. Grewal (Khanna Publication, Delhi), 42th Edition, 2012.
2	Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill), Edition, 2008

3	Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.), 8th Edition, 1999, Reprint 2010
4	Advanced Engineering Mathematics, 7e, by Peter V.O'Neil (Thomson Learning), Edition 2007
5	Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education), 2nd, Edition, 2002

Project Base Learning (Topics)	
1.	Echelon form
2.	Normal form
3.	Linear and orthogonal transformation
4.	Eigen values and eigen vectors
5.	Argand diagram
6.	De Movre's theorem
7.	Hyperbolic and logarithmic functions
8.	Leibnitz theorem
9.	Taylor's theorem
10.	L'Hospital rule
11.	Tests for convergence
12.	Euler theorem for homogeneous functions
13.	Total derivative
14.	Maxima and minima for two variable function
15.	Langrage undetermined multipliers

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – I (2023 course)

COURSE: PHYSICS FOR COMPUTING SYSTEM

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks	Credits: 4

Course Pre-requisites: The students should have knowledge of

1.	Algebra of matrices and determinants

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

1.	Linear equations and its basis and dimension.
2.	Linear mapping and its matrix representation.
3.	Orthogonalization and diagonalization of matrices.
4.	Understand the Quantum Mechanics

Course Outcomes: At the completion of the course, the students should be able to

1.	Interpret the properties of charged particles to develop modern instruments such as electron microscopy.
2.	Appraise the wave nature of light and apply it to measure stress, pressure and dimension etc.
3.	Summarize the structure and properties of lasers to their performance and intended applications.
4.	Classify the optical fiber, understanding the structure, types and its applications in the field of communication.
5.	Solve quantum physics problems to micro level phenomena and solid-state physics.
6.	Explain mechanical properties of solid matter, and connect to applications in the field of engineering.

Course Content:

Unit-I	**MODERN PHYSICS** Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatics focusing, Electron microscope, Wavelength and resolution, Specimen limitation, Depth of field and focus,Transmission electron microscope (TEM), Scanning electron	**(6 Hrs)**

	microscope (SEM), Separation of isotopes by Bainbridge mass spectrograph, Cathode ray tube (CRT).	
Unit-II	**WAVE OPTICS** Interference of waves, interference due to thin film (Uniform and non uniform (only formula-no derivation is expected), Newton's ring, Applications of interference (optical flatness, highly reflecting films, non-reflecting coatings).Diffraction Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima Polarisation Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.	**(6 Hrs)**
Unit-III	**LASERS** Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Single Hetro-junction laser, Gas laser: CO_2 laser, Properties of lasers, Laser speckles, Applications of lasers (Engineering/ industry, medicine, Computers).	**(6 Hrs)**
Unit-IV	**FIBRE OPTIC** Principle of fibre optics, Construction, Numerical Aperture for step index fibre; critical angle, angle of acceptance, V number, number of modes of propagation, types of optical fibres, Fibre optic communication system, advantages and disadvantages of fibre optics.	**(6 Hrs)**
Unit-V	**QUANTUM MECHANICS** Dual nature of matter, DeBroglie's hypothesis, Heisenberg's uncertainty principle with illustrations, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box, step potential and potential barrier (analytical discussion), tunnelling effect	**(6 Hrs)**
Unit-VI	**SOLID STATE PHYSICS** Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors(with derivation) and in extrinsic semi-conductors,	**(6 Hrs)**

	Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi- conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.	

Textbook:		
1.	A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS
2.	Arun Murthy, S. Chand Publishing (2018)
3.	Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
4.	Concepts of Modern Physics,Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education(2017)

Reference Books:		
1.	Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons(2013)
2.	Optics, Francis Jenkins and Harvey White, Tata Mcgraw Hill (2017)
3.	Principles of Physics, John W. Jewett, Cengage publishing (2013)
4.	Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5.	Principles of Solid-State Physics, H. V. Keer, New Age International (1993)
6.	Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7.	Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8.	Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd.(1997)
9.	Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)
10.	Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012).

Project Base Learning (Topics)	
1.	Measurement and effect of environmental noise in the college
2.	Design and simulation of automatic solar powered time regulated water pumping

3.	Solar technology: an alternative source of energy for national development
4.	Design and construction of digital distance measuring instrument
5.	Design and construction of automatic bell ringer
6.	Design and construction of remote-control fan
7.	Design and construction of sound or clap activated alarm
8.	Electronic eye (Laser Security) as auto switch/security system
9.	Electric power generation by road power
10.	Determination of absorption coefficient of sound absorbing materials
11.	Determination of velocity of O-ray and E-ray in different double refracting material
12.	Need of medium for propagation of sound wave
13.	Tesla Coil
14.	Thin film interference in soap film-formation of colours
15.	LiFi- wireless data transfer system using light

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – I (2023 course)

COURSE: ELECTRICAL TECHNOLOGY

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks	Credits: 4

Course Pre-requisites: NIL

Course Objective: To study of power system basics, magnetic circuits electrical machines, transformers, wiring, measurements, illumination and batteries.

Course Outcomes: At the completion of the course, the students should be able to

1.	Explain the various parameters related to magnetic circuit.
2.	Describe basic concepts of AC fundamentals and circuits.
3.	Illustrate constructional features and describe different parameters of transformer.
4.	Describe basic concepts of power system and three phase circuits.
5.	Demonstrate AC and DC electrical machine Classify types of batteries.
6.	Classify types of batteries.

Course Content:

Unit-I	Magnetic Circuits: Magnetic effect of electric current, Cross & Dot Convention, Right hand thumb rule, Concept of flux, flux linkages, magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability Kirchhoff's laws for magnetic circuits. Magnetic circuit concepts, analogy between electric& magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling.	**(6 Hrs)**
Unit-II	AC Fundamentals and circuits: AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasor, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series-parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems.	**(6 Hrs)**

Unit-III	Single Phase Transformer: Faradays law of electromagnetic induction, statically and dynamically induced EMF, self-inductance, mutual inductance, coefficient of coupling. Single Phase Transformer: Principle of operation, construction, e.m.f. equation, voltage ratio, current ratio, KVA rating, determination of efficiency and regulation by direct load test, equivalent circuit, power losses, (simple numerical problems), introduction to auto transformer. Three phase transformer and its different winding connections.	(6 Hrs)
Unit-IV	Introduction to Power System and Three Phase: Circuits: General layout of electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid (elementary treatment only) Power generation to distribution through overhead lines and underground cables with single line diagram. Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations, three phase power and its measurement (simple numerical problems).	(6 Hrs)
Unit-V	Electrical Machines: DC & AC: Principles of electromechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics, and applications of dc motors (simple numerical problems). single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).	(6 Hrs)
Unit-VI	Batteries: Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel Cadmium and Silver-Oxide batteries, charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries, Safe disposal of Batteries; Fuel cell: Principle & Types of fuel cell.	(6 Hrs)

Textbook:	
1.	B.L.Theraja, A Textbook of Electrical Technology, Vol.1, S.Chand& Company Ltd. NewDelhi
2.	V.K.Mehta, Basic Electrical Engineering, S Chand & Company Ltd. New Delhi.
3.	J.Nagarath and Kothari, Theroy and applications of Basic Electrical Engineering, PrenticeHall of India Pvt. Ltd.

Reference Books:		
1.	Electrical Technology - Edward Huges (Pearson	
2.	Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)	
3.	Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)	
4.	Electrical, Electronics Measurements and Instruments - (Satya Prakashan)	

Project Base Learning (Topics)	
1.	Building a small resistive load lamp bank
2.	Building a small resistive load lamp bank for various types of connections like series, parallel, star, delta
3.	Building a small inductive load lamp bank for various types of connections like series, parallel, star, delta
4.	Building a small capacitive load lamp bank for various types of connections like series, parallel, star, delta.
5.	Building a small resistive load lamp bank
6.	Building a staircase wiring model on a board
7.	Building a Go down wiring model on a board
8.	Rewinding of a choke
9.	Rewinding of a small transformer
10.	Building a small rectifier circuit on bread board
11.	Building a mobile charger circuit on a bread board
12.	Building an electric buzzer circuit
13.	Building a solar charger for mobile phone

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

COURSE: PROGRAMMING AND PROBLEM SOLVING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory:- 03 Hours/ Week Practical :- 04 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Practical : 25 Marks	Credits: 5

Course Pre-requisites: One can learn C, without ANY knowledge of Algorithms. Basic knowledge of mathematics is required.

Course Objective: The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also, by learning the basic programming constructs they can easily switch over to any other language in future.

Course Outcomes: At the completion of the course, the students should be able to

1.	Describe the problem-solving steps and write a pseudocode for a given problem.
2.	Identify the suitable control structure and write a C code for the same.
3.	Write the C code for a given algorithm.
4.	Illustrate use of pointers and functions
5.	Write programs that perform operations using derived data types.

Course Content:

Unit-I	**INTRODUCTION TO COMPUTER PROBLEM SOLVING** The Problem-solving Aspect, Top Down Design, Implementation of Algorithms, Program Verification, The Efficiency of Algorithms, The Analysis of Algorithms, Fundamental Algorithms: General problem-solving strategies: Introduction to program Planning tools- algorithm, flowcharts, and pseudo codes. Introduction to Programming Logic.	**(6 Hrs)**
Unit-II	**CONTROL STRUCTURES** Features of C, basic concepts, structure of C program, program, declarations, variables, data types, expressions, operator's assignment, arithmetic, relational, logical, increment and decrement, precedence of operators, type conversions, scanf and printf functions if-else, nested if-else, ladder if-else and switch statement. C Conditional control	**(6 Hrs)**

	structures: for, while do-while Unconditional control structures: break, continue, goto statement	
Unit-III	**ARRAYS AND STRINGS** Declaration initialization of one-dimensional Array, two-dimensional array, accessing array elements, Character Array/String, Character - Handling Library Functions, Standard Input/Output Library Functions for string.	**(6 Hrs)**
Unit-IV	**FUNCTIONS AND STRUCTURES** What is a Function, Benefits of a Function, Function Terminology, Array of Structures, How does Function Works, Scope and Lifetime of Variables in function ,Storage Classes of Variables , Call by value and call by reference,Recursion ,Overview of Structures , Defining and Using a Structure , Structures within a Structure.	**(6 Hrs)**
Unit-V	**POINTERS** Declaring and Initializing Pointers, Function and Pointer Parameters, Pointer Arithmetic, Pointer and Arrays, Two Dimensional Arrays and Pointers.	**(6 Hrs)**
Unit-VI	**FILES** File, Opening and Closing of Files, Writing and Reading in Text Format, Writing and Reading in Binary Format, Command Line Arguments.	**(6 Hrs)**

Textbook:		
1.	Let Us C by Yashavant Kanetkar, 13e, BPB Publication.	
2.	Brain W.Kernighan & Dennis Ritchie, C Programming Language, 2nd edition, PHI.	
3.	E. Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill4. How to Solve it by Computer by R. G. Dromey, 1e, Pearson Education.	

Reference Books:		
1.	1 C: The Complete Reference by Herbert Schildt	

Project Base Learning (Topics)	
1.	Design and develop a project for Diary management System

2.	Design and develop a project for Calendar using C
3.	Design and develop a project for Contact Management System
4.	Design and develop a project for Library Management System
5.	Design and develop a project for Snake Game
6.	Design and develop a project for Bus Reservation system
7.	Design and develop a project for Hospital Management system
8.	Design and develop a project for Employee management system
9.	Design and develop a project for Diary management System
10.	Design and develop a project for Calendar using C
11.	Design and develop a project for Contact Management System
12.	Design and develop a project for Library Management System

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – I (2023 course)

COURSE: INTERNET PROGRAMMING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 04 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Practical : 25 Marks	Credits: 5

Course Pre-requisites: Students Should Have Basic Knowledge About Computers, Web Applications And Internet.

Course Objective: This Course Content The Introduction To All Web Programming Languages With Detailed Study About HTML, CSS, DHTML, XML.

Course Outcomes: At the completion of the course, the students should be able to

1.	Explain The Fundamentals Of Programming Languages.
2.	Implementation Of Hyper Text Markup Language.
3.	Use Of Cascading Style Sheets In Web Page Development.
4.	Elucidate With Implementation Of Dynamic Hyper Text Markup Language.
5.	Describe With Implementation Of Extensible Markup Language.
6.	Understand Client And Server Side Technologies.

Course Content:

Unit-I	**INTRODUCTION TO INTERNET PROGRAMMING** Computer Network, Working Of Internet, Web Applications, Introduction To Web Programming Languages: HTML, DHTML, JSP, PHP, Python Django, Role Of The Server On The Internet, Introduction About Node JS And Angular JS, React JS.	**(6 Hrs)**
Unit-II	**HYPER TEXT MARKUP LANGUAGE** Introduction To HTML, Tags, Div Span, Lists, Images, Hyperlink, Table, Iframe, Form, Headers, All Content With HTML 5.	**(6 Hrs)**
Unit-III	**CASCADING STYLE SHEETS** Introduction To CSS, Syntax, Selectors, Background, Text Fonts, Lists Tables, Box Models, Display Positioning, Floats.	**(6 Hrs)**

Unit-IV	**DYNAMIC HYPER TEXT MARKUP LANGUAGE**	**(6 Hrs)**
	Introduction Of DHTML- HTML Vs. DHTML, Advantages Of DHTML, CSS Of DHTML, Introduction Of Event Handling, Mouse Handling, Data Binding, Browser Object Models.	
Unit-V	**EXTENSIBLE MARKUP LANGUAGE**	**(6 Hrs)**
	Introduction Of XML- Features Of XML, Anatomy of XML Document, The XML Declaration, Element Tags- Nesting and Structure, XML Schema, Importance Of XML Schema, Creating Element In XML Schema, XML Schema Types.	
Unit-VI	**TECHNOLOGIES FOR WEB APPLICATIONS**	**(6 Hrs)**
	Client-Side Technologies, Server-Side Technologies: Serve1et, URI Handlers, Middleware, Web Services, Web Application Architecture, Layered Architectures (2-1ayer, N-1ayer), Web 2.0 Vs Web 3.0.	

Textbook:	
1.	HTML & CSS: The Complete Reference, Fifth Edition Paperback By Thomas Powell, Mcgraw Hill Education.
2.	HTML & XHTML: The Complete Reference, By Thomas Powell,
3.	XML: The Complete Reference, By Heather Williamson, Mcgraw Hill Education 4HTML & XHTML: The Definitive Guide, 5th Edition, By Bill Kennedy And Chuck Musciano, O'Reilly Publication

Project Base Learning (Topics)	
1.	Website Development Hotel Management
2.	Website Development Personal Website
3.	Website Development Organization Website
4.	Website Development Dummy Ecommerce Website
5.	Website Development Login Page With User Credentials
6.	Development Of a Employee Interests Survey Form / Student Survey Form
7.	Technical Documentation Page
8.	Create Image Slider
9.	Railway Concession Form
10.	Website Development For Personal Portfolio
11.	Website Development Hotel Management
12.	Website Development Personal Website

13.	Website Development Organization Website

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – I (2023 course)

COURSE: UNIVERSAL HUMAN VALUES-I

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical :- 02 Hours/ Week	Term Work : 50 Marks	Credits: 1

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand the significance of value inputs in a classroom and start applying them in their life and profession.
2.	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3.	Understand the value of harmonious relationship based on trust and respect in their life and profession.
4.	Understand the role of a human being in ensuring harmony in society and nature.
5.	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
6.	Understand and differentiate with various Case studies and Strategies for Transition.

Course Content:

Unit-I	**NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION** Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration content and process; 'Natural Acceptance' and Experiential Validation as the mechanism for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities with priority. Understanding Happiness and Prosperity. Method to full fill human aspirations: understanding and living in harmony at various levels.	**(6 Hrs)**
Unit-II	**UNDERSTANDING HARMONY IN THE HUMAN BEING HARMONY IN MYSELF** Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.	**(6 Hrs)**

Unit-III	**UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY**- Harmony in Human-Human Relationship Understanding harmony in the Family. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfilment to ensure Ubhay-tripti;Trust (Vishwas) and Respect (Samman). Difference between intention and competence. Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society. Vasudhaiva Kutumbakam from family to world family!	(6 Hrs)
Unit-IV	**UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS CO-EXISTENCE** Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva). Holistic perception of harmony at all levels of existenc	(6 Hrs)
Unit-V	**IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS** Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics: a)Ability to utilize the professional competence for augmenting universal human order, b)Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models.	(6 Hrs)
Unit-VI	**CASE STUDIES AND STRATEGIES FOR TRANSITION** Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: a)At the level of individual: as socially and ecologically responsible engineers, technologists and managers	(6 Hrs)

b)At the level of society: as mutually enriching institutions and organization.	

Textbook:	
1.	R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2.	Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA .

Reference Books:	
1.	E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
2.	Sussan George, 1976, How the Other Half Dies, Penguin Press Reprinted 1986, 1991.
3.	Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972,Limits to Growth – Club of Rome's report, Universe Books.

Programme: B. Tech. Sem – I (2023 course)

COURSE: SBC-I COMPUTER PROGRAMMING-I(COMPUTER SYSTEM WORKSHOP TECHNOLOGY)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical :- 04 Hours/ Week	Term Work : 25 Marks Oral : 25 Marks	Credits: 2

Course Pre-requisites: Basic knowledge of Computer and Electronics.

Course Objective: Provide student a much-needed knowledge of computer hardware and networking, enabling them to identify computer hardware, software and network related problems, and develop an ability to use the basics of computing, necessary for computing courses.

Course Outcomes: At the completion of the course, the students should be able to

1.	Identify the architecture of a computer and its different components, including their technology evolution.
2.	Apply their knowledge about computer peripherals to identify problems.
3.	Install and uninstall given software step-by-step.
4.	Demonstrate the working of Internet.
5.	Prepare document using Latex.
6.	Use GitHub tool for coding and collaboration.

Course Content:

Unit-I	Computer hardware peripherals: Introduction to hardware components, random access memory (RAM), Types Of RAM & their speed, tips for buying ram, how to add memory to a computer, problems when installing memory, Central Processing Unit (CPU), Types Of CPU: considerations when buying a new CPU (Types & Differences), different speeds available for CPU and what do they mean, 32 Bit vs 64 Bit — Which One To Choose &Why? How to choose a CPU type for different needs? Graphic Card & Types, how to install a Graphics Card, Jumper Switch settings, Hard Disk upgrade, Different ports and why we use them - USB, PS2, DivX, Graphic card & types, Virtual Memory and how to configure it for optimum system performance.	(4 Hrs)

Unit-II	Assembly of Computer and Software Installations: Assembling the motherboard, replacing fan, how to avoid common mistakes during assembly, Installation of system software: Operating system (Windows and Linux), Installations step for operating system, Dual booting, Configure the BIOS, Installation of Antivirus, Installation of the open source software such as Sci lab, Latex Installation of MS Office	(4 Hrs)
Unit-III	Basic Diagnostic of Hardware and Software: Diagnosis of Power Up problem, Boot Drive, Errant Keyboard, mouse problems, slow computer performance, Computer freezes and displays BSOD (Blue screen of death), no display on monitor, no sound, computer rebooting or turning itself off, how to troubleshoot a computer that does not boot, Registry Cleaner.	(4 Hrs)
Unit-IV	Computer network environments: Network connecting devices. Configure the TCP/lP setting, connect to Local Area Network and access the Internet, Configuring Wireless network. Server and Its Configuration, Email Clients, Browsers, Office tools, customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers, Browsing netiquettes and cyber laws. Cloud Access Tools.	(6 Hrs)
Unit-V	Configuration of External devices: Physical set-up of Printers-Performing test print out, Printing of document etc., Scanner set-up, Webcam, Bluetooth device, Memory card reader etc.	(4 Hrs)
Unit-VI	Productivity tools: Open Source Tools Such as Latex, GitHub Latex: Format words, lines, and paragraphs, design pages, create lists, tables, references, and figures in LATEX.	(4 Hrs)

Textbook:	
1.	Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
2.	PC Hardware and A+ Handbook — Kate J. Chase PHI(Microsoft)
3.	LaTeX Companion — Leslie Lamport, PHI/Pearson.
4.	https://npte1.ac.in/courses/106/105/106105081/
5.	http://npte1.ac.in/courses/106105084/
6.	https://guides.github.com/

7.	Introduction to Linux: Installation and Programming, N B Venkateswarlu, BSPublication

Reference Books:		
1.	IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinsonand Ken Quamme. — CISCO Press, Pearson Education.	
2.	Computer Fundamentals, MS Office and Internet & Web Technology by Dinesh Maidasani.	

Project Base Learning (Topics)	
1.	Collect specifications of similar types of hardware and software and prepare report comparing them.
2.	Assembling and disassembling the PC back to working condition.
3.	Installation of operating systems LINUX on Server and different packages on a PC.
4.	Practice hardware troubleshooting exercises related to various components of computer like monitor, drives, memory devices, printers etc. and software troubleshooting related to BIOS etc.
5.	To start your own computer repair workshop. What would your initial planning involve? What would you look for in terms of building, furnishings, tools and any other equipment that you can think of?
6.	Cyber Hygiene: Installing antivirus for Windows.
7.	Prepare the report of need of programming language in 21st century.
8.	Collect various types of computer hardware and prepare summary report.
9.	Prepare Seminar report using LaTex.
10.	Prepare Project report using LaText.

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

B. Tech CSE (AIML) Semester II

COURSE: ENGINEERING MATHEMATICS- II

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory:- 03 Hours/ Week Tutorial :- 01 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 4

Course Pre-requisites: The students should have knowledge of differential calculus.

Course Objective: On completion of the course

1.	Fundamental theorems, concepts in Matrices, DeMoiver's Theorem and its applications in engineering.
2.	Various techniques in Calculus, Explanation of functions and Infinite series.
3.	Partial differentiation, maxima, minima, and its applications in engineering

Course Outcomes: At the completion of the course, the students should be able to

1.	Solve differential equations by different methods.
2.	Apply different laws to solve Simple Harmonic Motion, One–Dimensional Conduction of Heat.
3.	Solve integral calculus and Fourier series.
4.	Solve integral calculus with error functions.
5.	Determine position in solid geometry.
6.	Solve multiple integration problems.

Course Content:

Unit-I	**DIFFERENTIAL EQUATION OF FIRST ORDER AND FIRST DEGREE** Definition, Order and Degree of DE, Formation of DE, Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.	**(6 Hrs)**
Unit-II	**APPLICATIONS OF DIFFERENTIAL EQUATIONS** Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One–Dimensional Conduction of Heat.	**(6 Hrs)**

Unit-III	**FOURIE SERIES** Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.	**(6 Hrs)**
Unit-IV	**INTEGRAL CALCULUS** Reduction formulae, Beta and Gamma functions, Differentiation under the Integral Sign, Error functions.	**(6 Hrs)**
Unit-V	**SOLID GEOMETRY** Cartesian, Spherical Polar and Cylindrical Coordinate Systems, Sphere, Cone and Cylinder.	**(6 Hrs)**
Unit-VI	**MULTIPLE INTEGRALS AND THEIR APPLICATION** Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.	**(6 Hrs)**

Textbook:	
1.	Applied Mathematics (Volumes I and II) by P. N. Wartikar& J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune),7th Edition, 1988, Reprint 2010.

Reference Books:	
1.	Higher Engineering Mathematics by B.S. Grewal (Khanna Publication, Delhi), 42th Edition,2012.
2.	Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill), Edition, 2008.
3.	Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.), 8th Edition, 1999, Reprint 2010.
4.	Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning), Edition 2007.
5.	Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education), 2nd, Edition, 2002.

Project Base Learning (Topics)	
1	Formation of differential equation
2	Exact differential Equation
3	Linear differential equation
4	Newton's law of cooling
5	Newton's second law of motion

6	Fourier's law
7	Kirchhoff's voltage law
8	Fourier series
9	Harmonic analysis
10	Gamma and beta function
11	Reduction formulae
12	Locating position in three-dimensional space
13	Multiple integrals applications
14	Error function
15	Differentiation under integral sign

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – II (2023 course)

COURSE: ORGANIC AND ELECTRO CHEMISTRY

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory:- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 50 Marks	Credits: 4

Course Pre-requisites:

1.	The student should have
2.	Basic knowledge of chemistry.
3.	Basic knowledge of electrochemistry and chemistry of materials Introductory knowledge of polymers.

Course Objective: The student should acquire the knowledge of

1.	To develop the interest among the students regarding chemistry and their applications in engineering.
2.	To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
3.	The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the Engineering field.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand the different methods of analysis of water, different environmental pollutants and importance of green chemistry.
2.	Understand the importance of fuels and apply it for various engineering applications.
3.	Explain the drawbacks of corrosion and different methods of elimination of corrosion.
4.	Apply the concept of polymer to study advanced materials.
5.	Apply the basic concept of chemistry to explain the chemical properties and processes of materials of nanoscale.
6.	Understand the instrumental analysis helpful for various

Course Content:

Unit-I	WATER TECHNOLOGY & GREEN CHEMISTRY Introduction, sources and impurities in water, Hardness of water, types, and determination of hardness using EDTA titration, softening of hard	(6 Hrs)

	water by ion- exchange process. Numerical problems on hardness of water. Major environmental pollutants, Basic principles of green chemistry. Atom economy, Synthesis of adipic acid, Industrial applications of green chemistry, Numerical problems on Atom economy.	
Unit-II	**ELECTROCHEMICAL ENERGY AND SOLAR ENERGY** Fuels: Introduction, Definition, importance of fuels, calorific value, types, fluidized bed catalytic cracking, knocking(Petrol engine), mechanism and its ill effects, biodiesel, power alcohol, octane and cetane number. Solar Energy: Introduction, construction, working and applications of photovoltaic cell.	**(6 Hrs)**
Unit-III	**CORROSION TECHNOLOGY AND IT'S CONTROL** Introduction, Electrochemical theory of corrosion, Types of corrosion, Differential metal and differential aeration (pitting and water line) caustic embrittlement. Factors affecting the rate of corrosion, Corrosion control: Cathodic protection, sacrificial anode and impressed current methods, Metal coatings, Galvanization and tinning, Anodizing, Anodizing of aluminium, Organic coatings: Paint and varnishes. Metal finishing: Introduction, Technological importance. Principles of electroplating. Electroplating of chromium. Electro less plating: Introduction, electro less plating of nickel & copper on PCB with applications	**(6 Hrs)**
Unit-IV	**ENGINEERING MATERIALS AND TECHNOLOGY** Polymers: Introduction, classification, Synthesis and applications of Polyurethane, polycarbonates, Conducting Polymers: Synthesis & Mechanism of conduction in poly aniline. Composites: Introduction, constitution, classification. Types: fiber glass, hybrid and reinforced Composites with applications.	**(6 Hrs)**
Unit-V	**NANO MATERIALS** Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties). Synthesis of nano materials: Top down and bottom-up approaches, Synthesis by Sol-gel, precipitation and chemical vapour deposition, Nano scale materials:	**(6 Hrs)**

	Fullerenes, Carbon nano tubes and graphenes – properties and applications.	
Unit-VI	**INSTRUMENTAL METHODS OF ANALYSIS** Introduction, Theory, Instrumentation, and applications of conductometry Introduction to spectroscopy, principles UV/Vis.Spectroscopy colorimetry pHmetry, and applications of UV/Vis.Spectroscopy.	**(6 Hrs)**

Textbook:	
1.	Engineering Chemistry, Jain P.C & Jain Monica,Dhanpat Rai & Sons, Delhi (1992)
2.	Engineering Chemistry, O. G. Palanna, Tata McGraw-Hill Publication, New Delhi
3.	A textbook of Engineering Chemistry, S. S. Dara, McGraw-Hill Publication, New Delhi

Reference Books:	
1.	Engineering Chemistry- Fundamentals and applications, Shikha Agarwal,Cambridge Publishers (2015)

Project Base Learning (Topics)	
1.	Comparison of Hardness, Alkalinity, Dissolved oxygen, Chlorides and COD of water from two different sources.
2.	Removal of industrial pollutants from wastewater by adsorption on activated Charcoal.
3.	Preparation of biofuels from two natural sources.
4.	Two synthetic approaches for the production of H2 as a clean fuel.
5.	Prevention of corrosion by metal coupling .
6.	Construction of bio sensor in engineering applications.
7.	Design and simulation of automatic solar - photo voltaicpanels as renewable energysource.
8.	Synthesis of Conjugated Polymers and Molecules Using Sugar Reagents and
9.	Solventless Reactions. OR Composite materials and it properties, applications and types.
10.	To study mechanism of lubrication
11.	Electroplating- study on how different metals can be used and the practical applications.
12.	Prepare Ag- nanoparticles by using sol-gel method

13.	Preparation of Ag nanoparticle from two natural sources With the help of green chemistry principles, prepare any organic dye by using Traditional and Green pathway.
14.	Prepare epoxy resins by using suitable metho Measurement and effect of waste disposal from laboratories in the college To study coal analysis & its significance.

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – II (2023 course)

COURSE: DIGITAL ELECTRONICS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Oral : 25 Marks	Credits: 4

Course Objective:

1.	Present the Digital fundamentals, Boolean algebra and its applications in digital systems.
2.	To familiarize with the design of various combinational digital circuits using logic gates.
3.	To introduce the analysis and design procedures for synchronous and Synchronous sequential circuits To understand the various semiconductor memories and related technology.

Course Outcomes: At the completion of the course, the students should be able to

1.	Comprehend different number systems and Boolean algebraic principles.
2.	Apply logic design minimization techniques to simplify Boolean expressions.
3.	Analyse and design combinational logic circuits.
4.	Demonstrate the operations of systems with sequential circuit elements.
5.	Comprehend characteristics and structure of Programmable Logic Devices and Memory.

Course Content:

Unit-I	Digital systems:Number Systems: Introduction to Number Systems-Decimal, Binary, Octal, Hexadecimal,Conversion of number system, Representation of Negative Numbers, 1's Complement and 2's complement. Binary Arithmetic: Binary addition, Binary Subtraction, Subtraction using 1's complement and 2's complement, Binary multiplication, and division. Digital Codes: BCD code, Excess-3 code, Grey code and ASCII code. Logic Gates: Logical Operators, Logic	(6 Hrs)

	Gates-Basic Gates, Universal Gates, realization of other gates using universal gates.	
Unit-II	Logic Design Minimization: Boolean algebra, De Morgan's Theorems, Standard representation of logic functions, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using Karnaugh- Maps up to 4 variables Don't care condition, Quine-McCluskey Method	**(6 Hrs)**
Unit-III	Combinational Circuits: Binary and BCD arithmetic, Half Adder, Full Adder, Half Subtract or, Full Subtactor, Binary Adder (IC 7483), BCD adder, Code converters Multiplexers, De multiplexer, Decoder (IC 74138) and their use in combinational logic design, Priority Encoder, Digital Comparators, Parity generators and Checker (IC 74180), ALU	**(6 Hrs)**
Unit-IV	Sequential Circuits: Flip- flop SR, JK, D, T flip flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop. Registers: Buffer register, Shift register. Counters: Asynchronous counters, Synchronous counters, Modulus counters.	**(6 Hrs)**
Unit-V	FSM and ASM charts: Introduction to FSM, Moore and Mealy State machine, state machine as a sequential controller. Design of state machines: state table, state assignment, Transition/excitation table, excitation maps and equations, logic Realization, ASM chart notations, ASM block, State diagram, ASM chart for sequential circuits, Multiplexer Controller.	**(6 Hrs)**
Unit-VI	Memory and PLD: Semiconductor memories: memory organization, memory expansion, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM Programmable logic devices: Study of PROM, PAL, PLAs. Architecture of PLA, designing combinational circuits using PLDs.	**(6 Hrs)**

Textbook:	
1.	M. Morris Mano and M. D. Ciletti, Digital Design, Pearson Education
2.	.RP Jain, Modern Digital Electronics, Tata McGraw Hill Publication.
3.	1F.J. Hill and G.L. Peterson, Switching Theory and Logic Design, John Wiley

4.	J.F.Wakerly "Digital Design: Principles and Practices", 3rd edition, 4threprint, Pearson Education, 2

Reference Books:		
1.	David J. Comer, Digital Logic & State Machine Design, Oxford University Press.	
2.	Digital Integrated Electronics- H.Taub & D.Shilling, Mc Graw Hill.	

Project Base Learning (Topics)	
1.	Survey report of basic gates ICs 7432, 4011, 4050, 4070,4071,4010
2.	Implement combinational logic Circuit of given Boolean Equation.
3.	Implement Half Adder and Half Subtractor.
4.	Implement Full Adder using two Half Adders
5.	Build 4-bit parallel Adder / Subtractor using IC.
6.	Build Code Converters: Binary to Gray
7.	Build Code Converters: Excess 3 to Binary)
8.	Implement Two Bit Magnitude Comparator using IC 7485
9.	Implement given combinational logic using MUX
10.	Implement 7 segment decoder driver using IC 7447.
11.	Build a Decade counter and Up-Down Counter.
12.	Build a Shift Registers: SISO and SIPO
13.	Implement the Johnson Counter and Ring Counter.
14.	Survey Report on Static I/O and transfer Characteristic of TTL and CMOS.
15.	Implement given Boolean Function using PLA. (Function and Equation will be given by Subject Teacher)

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – II (2023 course)

COURSE: PROBABILITY AND STATISTICS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks	Credits: 4

Course Pre-requisites:

Course Objective: To Study

1.	Probability theory and expected value.
2.	Probability distribution and its applications.
3.	Multiple regression and ANOVA.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand rank of matrix and test consistency of system of linear equations.
2.	Understand to represent periodic function as Fourier series.
3.	Understand the methods to find Fourier and Z transform.
4.	Understand various numerical technique for ordinary and partial differential equation.
5.	Understand the hypothesis techniques.
6.	Understand concept of graph and its applications of tree.

Course Content:

Unit-I	Probability Theory: Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities.	**(6 Hrs)**
Unit-II	Random Variable and Mathematical Expectation: Definition of random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs, Examples	**(6 Hrs)**

Unit-III	Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution.	**(6 Hrs)**
Unit-IV	Correlation: Introduction: Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient, Properties of Spearman's rank correlation coefficient, Probable errors, Examples.	**(6 Hrs)**
Unit-V	HoLinear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between theurs) regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient. Multiple Regression and ANOVA: Multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction).	**(6 Hrs)**
Unit-VI	Multiple Regression and ANOVA: Multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction).	**(6 Hrs)**

Textbook:	
1.	S. C. Gupta, "Fundamentals of Statistics", 46th Edition, Himalaya Publishing House.
2.	G. V. Kumbhojkar, "Probability and Random Processes", 14th Edition, C. Jamnadas and co.
3.	Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability and Statistics, Schaum's Outlines

4.	Kishor S. Trivedi, "Probability, Statistics with Reliability, Queuing and Computer ScienceApplications", 2nd Edition, Wiley India Pvt. Ltd.

Reference Books:		
1.	Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction to Probability And Statistics, 3rdEdition, Wiley Publication.	
2.	I.R. Miller, J.E. Freund and R. Johnson.Fun "Probability and Statistics for Engineers" (4thEdition).	

Project Base Learning (Topics)	
1.	Students are expected prepare report on any one topic, write its definition, applications and analyze the hypothetical data. Also, write pseudo code for it, wherever applicable.
2.	Bayes theorem
3.	Additive and multiplicative law of probability
4.	Mathematical expectation
5.	Joint and marginal probability distribution
6.	Theoretical probability distribution
7.	Coefficient of correlation
8.	Regression estimates
9.	Simple regression model
10.	Multiple regression model
11.	One-way ANOVA
12.	Two-way ANOVA
13.	Correlation
14.	Multiple correlation

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – II (2023 course)

COURSE: OBJECT ORIENTED PROGRAMMING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory:- 04 Hours/ Week Practical :- 04 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Practical : 25 Marks	Credits: 6

Course Pre-requisites: C Programming

Course Objective: It covers Object Oriented Concepts through Java Programming language and it also covers Multiprogramming and Exception Handling.

Course Outcomes: At the completion of the course, the students should be able to

1.	To apply fundamental programming constructs.
2.	To illustrate the concept of packages, classes and objects.
3.	To elaborate the concept of strings arrays and vectors.
4.	To implement the concept of inheritance and interfaces.
5.	To implement the concept of exception handling and multithreading.
6.	To develop GUI based application.

Course Content:

Unit-I	Introduction to Object Oriented Programming OOP concepts: History and Features of Java, Difference between Procedural and Object- Oriented Programming, Objects, class, Encapsulation, Abstraction, Inheritance, Polymorphism, message passing, Java Virtual Machine, Basic programming constructs: variables, data types, operators, unsigned right shift operator, expressions, branching and looping.	(6 Hrs)

Unit-II	Class, Object, Packages and Input/output Class, object, data members, member functions Constructors, types, static members and functions Method overloading Packages in java, types, user defined packages Input and output functions in Java, Buffered reader class, scanner class.	(6 Hrs)
Unit-III	Array, String and Vector Array, Strings, String Buffer and its Constructors, Vectors, Methods of the Vector Class, Constructor of Vector.	(6 Hrs)
Unit-IV	Inheritance and Polymorphism Use of Inheritance, Types of Inheritance in Java, Role of Constructors in inheritance, Polymorphism in OOP, Types of Polymorphism, static and dynamic polymorphism, Overriding Super Class Methods. Use of "super" keyword. Interfaces, Implementing interfaces.	(6 Hrs)
Unit-V	Exception handling and Multithreading Exception handling using try, catch, finally, throw and throws, Multiple try and catch blocks, user defined exception Thread lifecycle, thread class methods, creating threads using extends and implements keyword.	(6 Hrs)
Unit-VI	GUI programming in JAVA Applet and applet life cycle, creating applets, graphics class functions, parameter passing to applet, Font and Color class. Event handling using event class AWT: working with windows, using AWT controls for GUI design Swing class in JAVA.	(6 Hrs)

Textbook:	
1.	Herbert Schildt, 'JAVA: The Complete Reference', Ninth Edition, Oracle Press
2.	E. Balagurusamy, 'Programming with Java', McGraw Hill Education.

Reference Books:	
1.	Ivor Horton, "Beginning JAVA", Wiley India.
2.	Dietal and Dietal, "Java: How to Program", 8th Edition, PHI .
3.	"JAVA Programming", Black Book, Dreamtech Press.4 "Learn to Master Java programming", Staredu solutions

Project Base Learning (Topics)	
1.	Smart City Project
2.	Currency Converter
3.	Online Exam Project in Java
4.	Moving Balls mini project using Java Applet
5.	Text Editor in Java using AWT controls.
6.	Album Manager Project in Java
7.	Vehicle Management System in Java
8.	Music Player project in Java
9.	Student Management System Project in Java
10.	Simple Calculator project in Java
11.	Image to PDF Convertor in java
12.	Simple Chat System
13.	Online Quiz project
14.	Pong game in java
15.	Tokenize implementation.

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – II (2023 course)

COURSE: COMMUNICATION SKILLS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical :- 02 Hours/ Week	Term Work : 25 Marks	Credits: 1

Course Outcomes: At the completion of the course, the students should be able to

1.	To enhance learners communication skills in both social and professional contexts.
2.	To sensitize students to their communicative behavior by allowing the learners, understand the basics and The importance of Technical Communication.
3.	To equip learners with the professional skills by giving training in writing various tasks like letters, Technical reports etc.
4.	To enhance learners communication skills in both social and professional contexts.

Course Content:

Unit-I	Introduction to Communication: Need for effective communication, Functions of Communication and Induction to the students. The Fundamentals of Communication: Communication Cycle, Levels of communication; Flow of communication; Communication networks; General and Technical Communication.	**(6 Hrs)**
Unit-II	Barriers to Effective Communication: Miscommunication; Noise; Types of barriers; Communication across Culture, case Studies and Overcoming measures Non-verbal Communication and Body Language: Forms of Non-verbal communication; Kinesics; Proxemics; Effective use of body language.	**(6 Hrs)**
Unit-III	Presentation Skills: 4Ps (Planning, Preparation, Practice, Presentation), Outlining; Effective use of A/V aids and Modes of Delivery.	**(6 Hrs)**

	Listening Skills: Hearing Vs listening, process of listening, types, Barriers to Listening, Qualities of a Good Listener and Active Vs Passive Listening.	
Unit-IV	Telephone Skills :Telephonic Communication: Do's and Don'ts Speaking Skills: Introducing yourself, Describing a person, place, situation and event, Giving instruction, Making in queries – at a bank, post-office, air-port, hospital, reservation counter and role play	**(6 Hrs)**
Unit-V	Writing Skills: Basics of Writing, Paragraph Writing, Precise Writing, Memos, Advertisements, Paraphrasing and Summarizing. Letter Writing: Informal Letter,(Formal)Business Letters: Essential and Occasional Parts of a letter, layout, Characteristic and Letter of Inquiry, Complaint and Adjustments, orders and replies of it	**(6 Hrs)**
Unit-VI	Report Writing: Format ,Structure and Types, Technical Reports, Description and Proposal Reading Skills: Skimming and Scanning, Intensive and Extensive Reading, Poor habits of reading and The SQ3RMethod	**(6 Hrs)**

Textbook:	
1.	Muralikrishna C., Sunita Mishra "Communication Skills for Engineers" 2nd edition, Pearson, New Delhi 2010
2.	Vyas Manish A., Yogesh L. Patel, "Tasks for the English Classroom", MacMillan, New Delhi, 2012.
3.	Achar Deeptha, Charul Jian and et al, English for Academic Purposes,Book-1&2 University Granthnirman Board, Gujarat, 2011
4.	Michael vince, 'Advanced Language Practice', Macmillan Education, oxford,2003
5.	Eisenbach Iris, "English for Materials Science and Engineering", Springer Fachmedien Wiesbaden GmbH 2011
6.	Lougheed Lin, "Business Correspondence: A Guide to Everyday Writing', Longman, Pearson Education, Inc,2003

Programme: B. Tech. Sem – II (2023 course)

COURSE: SBC-II-COMPUTER PROGRAMMING LAB II (SERVER-SIDE SCRIPTING LANGUAGE)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical :- 04 Hours/ Week	Term Work : 25 Marks Practical : 25 Marks	Credits: 2

Course Pre-requisites: Internet Programming

Course Objective: The objective of this course is to impart students with the knowledge to setup the development environment, designed develop dynamic database driven web applications using PHP.

Course Outcomes: At the completion of the course, the students should be able to

1.	Students will have the ability to Understand the basics of PHP Programming.
2.	Design interactive forms using PHP.
3.	Implement various operations on arrays and control structures.
4.	Create database and show the database connectivity.
5.	Implement cookies and session.
6.	Develop dynamic web content.

Course Content:

Unit-I	**INTRODUCTION TO WEB** Introduction to web technology, Web application, Web server, Client and Server, Scripting Languages.	**(6 Hrs)**
Unit-II	**BASICS OF PHP** PHP Basics, Introduction, XAMPP & WAMPP, Configure php.ini, PHP Syntax, Variables, Strings, Constants, Operators, Echo / Print, If....Else, Else if, Switch.	**(6 Hrs)**
Unit-III	**FUNCTIONS IN PHP** Loops, For, For each, While, Functions, string functions - introduction, user defined functions, Strings &Patterns, Quoting, Matching, Extracting, Searching, Replacing, Formatting, PCRE NOWDOC, Encodings.	**(6 Hrs)**

Unit-IV	**ARRAYS IN PHP** Arrays, Introduction, Array syntax, Array Index, get length without using pre-defined functions, Array push and pull, Associative arrays, loop through arrays, Multidimensional Arrays, Array functions, Array Sorting without using pre-defined functions, Introduction to PostgreSQL.	**(6 Hrs)**
Unit-V	**INTERACTING WITH DATABASE** Understand MySQL, simple SQL, retrieval, PHP database functions.	**(6 Hrs)**
Unit-VI	**SESSION AND COOKIES IN PHP** Sessions - introduction, start a PHP session, session variables, modify session, destroy session, Cookies, Start a PHP Cookies, Cookie variables, modify Cookie, destroy Cookie.	**(6 Hrs)**

Textbook:		
1.	1. Learning PHP, MySQL & Javascript, Robin Nixon, OREILLY, 4th	
2.	2. Head First PHP & MySQL-Lynn Beighley & Michael Morrison-	
3.	PHP: A Beginner's Guide-Vikram Vaswani- McGraw-Hill Education	

Reference Books:		
1.	The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill	
2.	The Joy of PHP Programming: A Beginner's Guide – Alan Forbes,BeakCheck LLC,6th edition.	

Project Base Learning (Topics)	
1.	To create a PHP-powered web portal that needs no authentication for visitors to view the information published.
2.	To develop a website offering car renting services.
3.	Develop a converter program for the area, length, speed, temperature, volume, and
4.	To create a social network like Facebook.
5.	To create a website having songs and related information, such as personnel details, duration, genre, etc.
6.	To develop a simple and effective web-based photo editor with editing, selection, and positioning photos as well asto prepare publication-ready images.
7.	To develop a small tool for customer relationship management.
8.	To develop Time Table Generator

9.	To collect, organize, and manage student information effectively.
10.	Online School Administration Management System
11.	Online Paying Guest Accommodation Project
12.	College Admission Predictor
13.	ERP System for College Management
14.	CRM For Internet Service Provider
15.	Online Blood Bank Project
16.	Movie Success Prediction Using Data Mining
17.	Web-based Chat Application with Webcam
18.	College Social Network Project
19.	Canteen Food Ordering and Management System
20.	Fake Product Review Monitoring & Removal for Genuine Ratings

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

B. Tech CSE (AIML) Semester III

Programme: B. Tech. Sem – III (2023 course)

COURSE: DISCRETE MATHEMATICS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Wee Tutorial :- 01 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 4

Course Pre-requisites: Basic knowledge of Elementary Linear Algebra, Numerical Mathematical Computation, Programming basics.

Course Objective: The objective is to provide a mathematical foundation and skills that are required in further study of Computer Science and Engineering. The course Discrete Mathematical Structures deals with discrete objects, countable sets. It helps to develop logical thinking and a wide variety of real-world applications to computer science. It is a very good tool for improving reasoning and problem-solving capabilities.

Course Outcomes: At the completion of the course, the students should be able to

1.	Demonstrate the ability to write the sentences in the symbolic logic and evaluate a proof technique.
2.	Apply the basic principles of set theory to analyse the data relationship and prove basic properties of set.
3.	Use Chinese Remainder Theorem & the Euclidean algorithm for modular arithmetic.
4.	Analyse the properties of relations and functions to determine their properties.
5.	Solve problems of combinatory and recurrence relations.
6.	Model problems in Computer Science using graphs and trees.

Course Content:

Unit-I	**LOGIC AND PROOFS** Propositions, Conditional Propositions, Logical Connectivity, Predicates and Quantifiers, First order logic, Proof Techniques, Mathematical Induction.	**(6 Hrs)**

Unit-II	**SET THEORY AND NUMBER THEORY**	**(6 Hrs)**
	Set theory: Definition and examples, Combination of sets, Finite and Infinite sets, Principle of inclusion and exclusion. Number Theory: Basics of Modulo Arithmetic, Basic Prime Number Theory, GCD, LCM, Divisibility, Euclid's algorithm, Factorization, Congruence, Inverse , multiplicative inverse, Chinese Remainder Theorem.	
Unit-III	**RELATIONS AND FUNCTIONS**	**(6 Hrs)**
	Relations: Definitions, Properties of Binary Relations, Equivalence Relations and partitions, Partial ordering relations and lattices, Hasse diagrams, Chains and Anti chains, Closure: Transitive closure - Warshall's Algorithm, Functions: Definition, Domain, Range, Image, etc. Types of functions: Surjection, Injection, Bijection, Inverse, Identity, Composition of Functions.	
Unit-IV	**COMBINATORICS AND RECURRENCE RELATION**	**(6 Hrs)**
	Basic Counting Techniques (sum, product, subtraction, division, exponent), Pigeonhole and Generalized Pigeonhole Principle with many examples, Permutations and Combinations and numerical problems.	
Unit-V	**GRAPHS & TREES**	**(6 Hrs)**
	Graphs: Basic terminology, multi graphs and weighted graphs, Digraphs, paths and circuits, shortest path Problems, Euler and Hamiltonian paths and circuits, factors of a graph, planar graph and Dijkstras algorithm, independent sets, connectivity graph coloring. Trees: rooted trees, path length in rooted trees, binary search trees, spanning trees, cut sets, minimum spanning trees, Kruskal''s and Prim's algorithms for minimum spanning tree.	
Unit-VI	**ALGEBRAIC SYSTEMS**	**(6 Hrs)**
	Algebraic Systems, Groups, Semi Groups, Monoids, Subgroups, Permutation Groups, Codes and Group codes, Isomorphism and Automorphisms, Homomorphism and Normal Subgroups, Ring, Field.	
Textbook:		
1.	J.P. Tremblay and Manohar: Discrete mathematical structures with application to Computer Science, McGraw hill- New Delhi.	

2.	Kolman and R.C. Busby: Discrete mathematical structures for computer science Prentice Hall, New- Delhi.	

Reference Books:		
1.	Malik and M. K. Sen: Discrete Mathematics, Cengage Learning India Pvt. Ltd.	
2.	R.M. Somasundaram: Discrete Mathematical Structures, Prentice Hall India LearningPrivate Limited.	
3.	C.L.Liu, Elements of Discrete Mathematics, second edition, McGraw-Hill BookCompany.	
4.	Kenneth H. Rosen: Discrete Mathematics and its applications Eighth Edition McGrawHill Education.	

Project Base Learning (Topics)	
1.	Discrete Mathematics in Railway Planning using graph theory and linear algebra.
2.	Object transformations using linear algebra.
3.	Discrete mathematics in cryptography.
4.	In Google maps to determine fastest driving routes and times.
5.	In image processing
6.	In relation database using sets.
7.	In cyber security using graph theory.
8.	Shortest path between two cities using a transportation system.
9.	Data compression system with the help of Huffman coding.
10.	Find the shortest tour that visits each of a group of cities only once and then ends in the starting city using graphs.

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – III (2023 course)

COURSE: DATA STRUCTURE

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory:- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Practical : 25 Marks	Credits: 4

Course Objective: To understand the need and significance of Data structures as a computer   Professional and to teach concept and implementation of linear and Nonlinear data structures.

Course Outcomes: At the completion of the course, the students should be able to

1.	Students will be able to implement Linear and Non-Linear data structures.
2.	Students will be able to handle various operations like searching, insertion ,deletion and traversals on various data structures.
3.	Students will be able to explain various data structures, related terminologies and its types.
4.	Students will be able to choose appropriate data structure and apply it to solve problems in various domains.
5.	Students will be able to analysis and implement appropriate searching techniques fora given problem.
6.	Students will be able to demonstrate the ability to analyse, design, apply and use data structures to solve engineering problems and evaluate their solutions.

Course Content:

Unit-I	INTRODUCTION TO DATA STRUCTURES AND STACKS Introduction to Data Structures, Concept of ADT, Types of Data Structures- Linear and Nonlinear, Operations on Data Structures. Introduction, ADT of Stack, Operations on Stack, Array Implementation of Stack, Applications of Stack-Well form-ness of Parenthesis, Infix to Postfix Conversion and Postfix Evaluation, Recursion	(6 Hrs)

Unit-II	QUEUES Introduction, ADT of Queue, Operations on Queue, Array Implementation of Queue, Types of Queue-Circular Queue, Priority Queue, Introduction of Double Ended Queue, Applications of Queue.	(6 Hrs)
Unit-III	LINKED LIST Introduction, Representation of Linked List, Linked List v/s Array, Types of Linked List - Singly Linked List, Circular Linked List, Doubly Linked List, Operations on Singly Linked List and Doubly Linked List, Stack and Queue using Singly Linked List, Singly Linked List Application- Polynomial Representation and Addition.	(6 Hrs)
Unit-IV	TREES Introduction, Tree Terminologies, Binary Tree, Binary Tree Representation, Types of Binary Tree, Binary Tree Traversals, Binary Search Tree, Operations on Binary Search Tree, Applications of Binary Tree-Expression Tree, Huffman Encoding, Search Trees-AVL, rotations in AVL Tree, operations on AVL Tree, Introduction of B Tree, B+ Tree.	(6 Hrs)
Unit-V	GRAPHS Introduction, Graph Terminologies, Representation of Graph, Graph Traversals-Depth First Search (DFS) and Breadth First Search (BFS), Graph Application- Topological Sorting.	(6 Hrs)
Unit-VI	SEARCHING TECHNIQUES Linear Search, Binary Search, Hashing-Concept, Hash Functions, Collision resolution Techniques	(6 Hrs)

Textbook:		
1.	Aaron M Tenenbaum, Yedidyah Langsam, Moshe J Augenstein, "Data StructuresUsing C",Pearson Publication.	
2.	Reema Thareja, "Data Structures using C", Oxford Press.	
3.	Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures: A PseudocodeApproachwith C", 2ndEdition, CENGAGE Learning	

Reference Books:		
1.	Prof. P. S. Deshpande, Prof. O. G. Kakde, "C and Data Structures", DreamTech press.	
2.	E. Balagurusamy, "Data Structure Using C", Tata McGraw-Hill Education India.	

3.	Rajesh K Shukla, "Data Structures using C and C++", Wiley-India

Project Base Learning (Topics)

1.	Study the writings of Lewis Carroll on symbolic logic. Describe in detail some of the models he used to represent logical arguments and the rules of inference he used in these arguments.
2.	Describe a variety of different applications of the Fibonacci numbers to the biological and the physical sciences.
3.	Explain how graph theory can help uncover networks of criminals or terrorists by studying relevant social and communication networks.
4.	Explain what community structure is in a graph representing a network, such as a social network, a computer network, an information network, or a biological network. Define what a community in such a graph is, and explain what communities represent in graphs representing the types of networks listed.
5.	Describe how Euler paths can be used to help determine DNA sequences.
6.	Describe some of the strategies and algorithms used to solve the traveling salesperson problem.
7.	Explain how graph multi-colorings can be used in a variety of different models.
8.	Define a heap and explain how trees can be turned into heaps. Why are heaps useful in sorting?
9.	Describe the techniques used by chess-playing programs such as Deep Blue or stock fish.
10.	Discuss the algorithms used in IP multicasting to avoid loops between routers.
11.	Compare and contrast some of the most important sorting algorithms in terms of their complexity and when they are used.
12.	Describe an algorithm for finding the minimum spanning tree of a graph such that the maximum degree of any vertex in the spanning tree does not exceed a fixed constant k
13.	Describe the origins of mathematical induction. Who were the first people to use it and to which problems did they apply it?
14.	Explain how the ideas and concepts of program correctness can be extended to prove that operating systems are secure.

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – III (2023 course)

COURSE: COMPUTER ORGANIZATION AND MICROPROCESSOR

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory:- 03 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 3

Course Pre-requisites: Students should have knowledge of Fundamental Knowledge of computing/programming, Concepts of Digital systems design, Basic idea of writing computer program.

Course Objective: To give an overview of Computer Organization and Micro-processors concepts., illustrate memory hierarchy and its operation in computing environment, study various Input – Output devices interfacing & to demonstrate their operations, demonstrate different philosophy of Control Unit design and illustrate design concepts of Arithmetic and Logical unit.

Course Outcomes: At the completion of the course, the students should be able to

1.	To understand basic operations of computer architecture leading to its organization.
2.	To analyse various memory organization techniques.
3.	To demonstrate input and Output interfacing.
4.	To recommend Control Design approach as per the need.
5.	To understand micro-processor architecture and its operations.
6.	To understand High Performance computing environment.

Course Content:

Unit-I	MACHINE ARCHITECTURE AND ORGANIZATION	(6 Hrs)
	Von Neumann architecture Structure of IAS machine, memory, input-output subsystems, control unit. Addressing Modes, Three/Two/One/Zero address instructions. Stored program concept. Instruction Cycle, Instruction types and formats. 8086 microprocessors (Functional diagram features)	

Unit-II	**ALU**	**(6 Hrs)**
	Number representation and number conversion. Computer arithmetic, signed number representation, fixed and floating point representations, character representation. IEEE 754 format. Integer addition and subtraction, signed/unsigned number (Booth's multiplications) Hardware Implementation of Booths method. Restoring and Non-Restoring Division techniques, floating point arithmetic.	
Unit-III	**MEMORY**	**(6 Hrs)**
	Characteristics of Memory system, Memory hierarchy, Cache memory, cache size and block size, mapping functions, replacement algorithms, cache coherency, Multilevel Caches, Cache Coherence, Snooping & MESI Protocols, Memory Segmentation (reference to 8086) &Interleaved Memory System. Numerical on Memory mapping, Cache updating.	
Unit-IV	**INPUT-OUTPUT ORGANIZATION**	**(6 Hrs)**
	I/O module, Peripheral devices and their characteristics, Input-output subsystems, I/O device interface, I/O transfers, interrupt driven and DMA transfer, I/O device interfaces – SCSI, USB.	
Unit-V	**CONTROL UNIT**	**(6 Hrs)**
	Concept of CU design (Hardwired/Micro programmed approach), Concept of Hardwired Control Unit with working details block/functional diagram advantages and drawbacks. Concept of Micro programmed control unit design, block and functional diagram. Micro instructions and micro program, Organization and Optimization of micro-programmed Control unit, Microinstruction Sequencing, Sequencing Techniques, Address Generation, Microinstruction Execution.	
Unit-VI	**PARALLEL ORGANIZATION**	**(6 Hrs)**
	Overview of Instruction Pipelining, Performance Improvement, Flynn's classification for Multiple Processor Organizations, Closely and Loosely Coupled Multiprocessors Systems, Symmetric Multiprocessor (SMP) Organization, Multithreading – Fine Grained, Coarse Grained &Simultaneous (SMT) Threading, Chip Multiprocessing, Cluster Configuration, UMA, NUMA & CC-NUMA.	

	Multicore Architectures – Hardware & Software Issues in Multicore Organization.	

Textbook:		
1.	Computer System Architecture M. M. Mano:, 3rd ed., Prentice Hall of India, New Delhi, 1993.	
2.	Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.	
3.	Computer Organization and Embedded Systems, Carl Hamacher.	

Reference Books:	
1.	Computer Architecture and Organization, John P. Hayes.
2.	Computer Organization and Architecture: Designing for Performance, William Stallings.

Project Base Learning (Topics)	
1.	Case studies in recent trends in Computer Architecture
2.	Case studies in Hardware Description Languages and Simulators
3.	Recent Trends in Control Unit Design
4.	Case studies in recent Memory Technologies
5.	Case studies in recent trends in Multiprocessor Architectures
6.	Case studies in recent trends in Parallel Computing
7.	Projects using Sensors and microcontroller.

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – III (2023 course)

COURSE: DATABASE MANAGEMENT SYSTEM

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory:- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks	Credits: 4

Course Pre-requisites: Any Programming Language

Course Objective:

1.	To Understand the basic concepts and the applications of database systems.
2.	To Master the basics of SQL and construct queries using SQL.
3.	To understand the relational database design principles.
4.	To become familiar with the basic issues of transaction processing and concurrency control.
5.	To become familiar with database storage structures and access techniques.

Course Outcomes: At the completion of the course, the students should be able to

1.	Describe the fundamental elements of relational database management systems
2.	Explain the basic concepts of relational data model, entity-relationship model, relational database design.
3.	Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
4.	Improve the database design by normalization.
5.	Understand the concept of Relation algebra and Calculus.
6.	Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.

Course Content:

Unit-I	**INTRODUCTION TO DBMS** Overview of Database Management System, Database System	**(6 Hrs)**

	Architecture, File systems Advantages of DBMS, View of data, levels of data abstraction, Instances and Schemas, Data Models, Database Languages, Role of DBA.	
Unit-II	**DATABASE DESIGN** Constraints, Design Issues, Weak Entity Sets, attributes, Extended ER features, Integrity constraints, Key constraints, Participation constraints, ER-EER to Relational mapping. Subclasses and inheritance, Specialization and Generalization, Modelling of UNION types using categories.	**(6 Hrs)**
Unit-III	**QUERY** **PROCESSING** DDL: Create, Modify, Alter, Drop, View definition, DML: SELECT, INSERT, DELETE, Update, Nested Query, SQL with SET operations, Aggregate Functions,Nested and Complex Queries, Join Queries. DCL: GRANT, REVOKE. Cursors and Triggers: Exception Handling, PL/SQL Subprograms – Procedures and Functions; PL/SQL Packages.	**(6 Hrs)**
Unit-IV	Normalization Functional dependencies, Armstrong's axioms, Closure, finding primary keys using FDs, Normal forms: 1NF, 2NF,3NF, Boyce-Codd Normal Forms, Multi- values dependencies and fourth normal form, Join dependencies and fifth normal form, Inclusion dependencies, Properties of decompositions Transaction & Concurrency Control: Transaction concept, ACID properties, Conflict & View serializability, Test for Conflict serializability, Concurrency Control, Lock base protocols, two phase locking.	**(6 Hrs)**
Unit-V	**RELATION** **ALGEBRA** **AND** **CALCULUS** Relational Algebra: Selection, Projection, Set operations, Renaming, Joins, Division, Subtraction.Relational Calculus: Tuple relational calculus, Domain relational calculus. Integrity Constraints & Introduction to RDBMS, Domai Constraints, Referential Integrity Constraints, Codd's rule.	**(6 Hrs)**
Unit-VI	**STORAGE AND INDEXING** Storage structures: Secondary storage devices, buffering of blocks,	**(6 Hrs)**

	Basic file systems – File organization – Serial, Sequential, Indexed Sequential, Searching, Clustered Indexing, Primary & secondary indexes, Hash based indexing, Tree Based Indexing, hashing techniques, B+ tree-based files. Distributed Databases: Basic Concepts, Data Fragmentation, Replication and Allocation Techniques, Types of Distributed Database Systems, Query Processing, Overview of Client-Server Architecture and Its relationship to Distributed Databases.	

Textbook:		
1.	Elmasri and Navathe, "Fundamentals of Database System", 5th Edition, Addison Wesely Publication. (2006).	
2.	Abraham Silberschatz, Henry Korth, Sudarshan, "Database SystemConcepts", 6th Edition, (2010).	
3.	Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, Second	
4.	Edition, McGraw-Hill, 2002.	

Reference Books:		
1.	Peter Rob and Coronel, "Database systems, Design, Implementation and Management",5th Edition, Thomson Learning,2001.	
2.	C. J. Date,"An Introduction to Database Systems", 8/e, Pearson Education,2002.	

Project Base Learning (Topics)	
1.	Implement any database management systems with CRUD functionality and design normalised at least up to 3 NF. Apply appropriate integrity constraints and access privileges to database and relations. Show indexing. (Any implemented system must have at least 7 inter-related normalised relations.

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – III (2023 course)

COURSE: PYTHON PROGRAMMING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Practical : 25 Marks	Credits: 4

Course Pre-requisites: Computer Fundamentals

Course Objective:

1.	To be able to introduce core programming basics and various Operators of Python programming language.
2.	To develop logic for Problem Solving.

Course Outcomes: At the completion of the course, the students should be able to

1.	To understand the concepts of programming before actually starting to write programs.
2.	Build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions.
3.	To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.
4.	To be made familiar about the file and exceptional handling.
5.	To understand Regular Expressions in Python Programming.
6.	To apply concepts of object oriented programming in Python.

Course Content:

Unit-I	**INTRODUCTION** Introduction: The Python Programming Language, History, features, Installing Python, Running Python program, Debugging: Syntax	**(6 Hrs)**

	Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses, Variables and Expressions Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations.	
Unit-II	**CONDITIONAL STATEMENT AND FUNCTIONS** Conditional Statements: if, if-else, nested if –else Looping: for, while, nested loops Control statements: Terminating loops, skipping specific conditions Functions: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations.	**(6 Hrs)**
Unit-III	**LIST, TUPLE AND DICTIONARY** Lists: Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods Tuples and Dictionaries: Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable- length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary	**(6 Hrs)**
Unit-IV	**FILES AND EXCEPTION HANDLING** Methods Files: Text Files, The File Object Attributes, Directories Exceptions: Built-in Exceptions, Handling Exceptions, Exception with Arguments, User- defined Exceptions	**(6 Hrs)**
Unit-V	**REGULAR EXPRESSION** Regular Expressions – Concept of regular expression, various types of regular expressions, using match function.	**(6 Hrs)**

Unit-VI	CLASSES	(6 Hrs)
	Classes and Objects: Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation,Data Hidin	

Textbook:	
1.	"Python Crash Course" (3rd Edition) by Eric Matthes

Reference Books:		
1.	"Automate the Boring Stuff with Python, 2nd Edition" by Al Sweigart	
2.	Python for Everybody: Exploring Data Using Python 3" by Charles Severance	

Project Base Learning (Topics)	
1.	Student Database Management System
2.	Simple Calculator
3.	Number Guessing Game
4.	Basic Contact Management System
5.	Design a password generator
6.	Simple Banking System
7.	Quiz Application
8.	Contact Book
9.	Simple Banking System
10.	Basic ATM Simulator
11.	Library Database Management System
12.	Tour and travels Database Management System

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – III (2023 course)

COURSE: SKILL BASED COURSE-III COMPUTER PROGRAMMING –III(J2EE)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical :- 02 Hours/ Week	Term work :25 Marks Practical : 25 Marks	Credits: 1

Course Pre-requisites: This course is designed to meet the needs of Java programmers who want to be professional in building mission-critical enterprise software using EJB. Students should be familiar with programming techniques and have substantial Java programming experience including JDBC, RMI, Servlets and JSP.

Course Objective: To develop enterprise applications like web pages and portals among the students using enterprise software Java 2 Enterprise Edition.

Course Outcomes: At the completion of the course, the students should be able to

1.	To understand the importance of extension JDBC package in Enterprise Java applications.
2.	To understand and use the Java Persistence Architecture API for ORM activities (JPA).
3.	To implement asynchronous applications and Message Driven Beans using JMS.
4.	To apply Security in Java EE Applications.
5.	To learn send/receive mails using Internet protocols SMTP, IMAP and POP3 (Java Mail).
6.	To master the whole process of designing, implementing, and deploying J2EE Applications and access Web Service components using EJB in a Java EE application.

Course Content:

Unit-I	**REMOTE METHOD INVOCATION (RMI) AND CORBA**	**(6 Hrs)**
	Object Persistence and Serialization, Introduction to Distributed Computing, RMI Architecture, Importance of RMI Registry, Developing Simple RMI application, Call back Implementation in RMI. Introduction to CORBA, CORBA for Distributed computing, ORB & IIOP, Interface Definition Language (IDL)	
Unit-II	**JAVA PERSISTENCE API (JPA) AND JDBC EXTENSION**	**(6 Hrs)**
	Designing Persistent Class, Entity Fields and Properties, Entity Instance Creation, Primary Keys and Entity Identity, Entity Relationships, Entity Operations, Entity Manager, Entity Instance Life Cycle, Persistence Context javax. sql package (Extension to JDBC), Data Source and Connection Pool, Using JDBC and JNDI	
Unit-III	**JAVA MESSAGE SERVICE (JMS)**	**(6 Hrs)**
	Benefits of using JMS, Pub/Sub Model, Point-to-Point Model, Message Formats, Headers & Properties, How JMS fits into EJB system, Developing Message Driven Beans (MDB)	
Unit-IV	**SECURITY MODEL**	**(6 Hrs)**
	Role-Driven Access Control, Security Identity, Security and the Deployment Descriptor, Using Security Roles, Accessing Security Information via EJB Context, Using JAAS to access secure EJB	
Unit-V	**JAVA EE APPLICATION**	**(6 Hrs)**
	Java EE Architecture, Introduction to Java EE Components, Containers and Connectors, Java EE Modules (Web App, EJB JAR, App Client), Structure of Java EE Application (Enterprise Archive), Packaging and Deploying Java EE Applications	
Unit-VI	**WEB SERVICES**	**(6 Hrs)**
	Introduction to Web Services, Service Oriented Architecture, Architecture and Advantages, SOAP Significance, WSDL Importance, Web Service Annotations, Implementing a Web Service, Java API for XML Web Services (JAX-WS), Writing a Web Service Client	
Textbook:		
1.	Modern Java EE Design Patterns: Building Scalable Architecture for Sustainable Enterprise Development, Markus Eisele, O'Reilly Media.	

2.	Java 11: Web applications and Java EE: Software development, Poul Klausen

Reference Books:	
1.	"Automate the Boring Stuff with Python, 2nd Edition" by Al Sweigart
2.	Python for Everybody: Exploring Data Using Python 3" by Charles Severance

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – III (2023 course)

<table>
<tr><td colspan="3" align="center">**COURSE: INTELLECTUAL PROPERTY RIGHTS**</td></tr>
<tr><td>**TEACHING SCHEME:**</td><td>**EXAMINATION SCHEME:**</td><td>**CREDITS:**</td></tr>
<tr><td>Theory:- 02 Hours/ Week</td><td>Internal Assessment: 100 Marks</td><td>Credits: 2</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">**Course Pre-requisites:** NIL</td></tr>
<tr><td colspan="3">**Course Objective:** The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work. To understand how to protect trademarks applied for in the country and to provide for better protection of trademark for goods and services and also to prevent fraudulent use of the mark. By the end of the course, students should be proficient in understanding and navigating the legal landscape of intellectual property, ensuring they can effectively protect and manage their intellectual assets.</td></tr>
<tr><td colspan="3">**Course Outcomes:** At the completion of the course, the students should be able to</td></tr>
<tr><td>1.</td><td colspan="2">CO 1: Understanding IPR: Educate students on the importance and scope of Intellectual Property Rights, including patents, trademarks, copyrights, and trade secrets.</td></tr>
<tr><td>2.</td><td colspan="2">CO 2: Patent Protection: Teach students the process of patenting their intellectual assets, including filing applications, understanding patent laws, and navigating the patent approval process.</td></tr>
<tr><td>3.</td><td colspan="2">CO 3: Trademark Awareness: Provide knowledge on protecting trademarks in the country, ensuring better protection for trademarks related to goods and services, and preventing fraudulent use of marks.</td></tr>
<tr><td>4.</td><td colspan="2">CO 4: Legal Framework: Familiarize students with the legal provisions and laws governing intellectual property, including national and international regulations.</td></tr>
</table>

5.	CO 5: Practical Application: Encourage practical understanding by involving students in case studies, legal document preparation, and real-world scenarios related to intellectual property protection.	
6.	CO 6: Innovation and Entrepreneurship: Foster innovation and entrepreneurial skills by helping students understand how to leverage their intellectual property for business ventures and commercial success.	

Course Content:		
Unit-I	**INTRODUCTION TO IPR** Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights .	**(4 Hrs)**
Unit-II	**INTRODUCTION TO TRIPS AND WTO** Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge.	**(4 Hrs)**
Unit-III	**PATENT RIGHTS AND COPY RIGHTS** Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Rights and Duties of Patentee, Assignment and licence, Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties.	**(4 Hrs)**
Unit-IV	**COPY RIGHT** Origin, Definition &Types of Copy Right, Registration procedure, Assignment & licence, Terms of Copy Right, Piracy, Infringement, Remedies, Copy rights with special reference to software.	**(4 Hrs)**
Unit-V	**TRADE MARKS** Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks, Infringement & Remedies, Offences relating to Trade Marks, Passing Off, Penalties. Domain Names on cyber space.	**(4 Hrs)**
Unit-VI	**DESIGN** Meaning, Definition, Object, Registration of Design, Cancellation of Registration, International convention on design, functions of Design. Semiconductor Integrated circuits and layout design Act-2000.	**(4 Hrs)**

Textbook:		

1.	"An Introduction to Intellectual Property Rights", by J P Mishra, Central Law Publications. Deccan Law House.
2.	"Law Relating to Intellectual Property Rights", by V K Ahuja, 3rd Edition (Student Edition) LexisNexis

Reference Books:

1.	"Law Relating to Intellectual Property Rights", by M.K. Bhandari, Edition: 6th Edition, 2021 Reprint 2023
2.	"Intellectual Property Law", by Avtar Singh, Eastern Book Company.

B. Tech CSE (AIML) Semester IV

Programme: B. Tech. Sem – IV (2023 course)

COURSE: THEORY OF COMPUTATION

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week	Semester End Examination: 60 Marks	Credits: 4
Tutorial :- 01 Hours/ Week	Internal Assessment: 40 Marks	

Course Pre-requisites: Discrete Mathematics, Data Structures and algorithms.

Course Objective:

1.	It will give an overview of the theoretical foundations of computer science from the perspective of formal languages
2.	Will illustrate finite state machines to solve problems in computing
3.	It will explain the hierarchy of problems arising in the computer sciences.
4.	Students will get familiarize with Regular grammar and context frees grammar.

Course Outcomes: At the completion of the course, the students should be able to

1.	To use basic concepts of formal languages of finite automata techniques.
2.	To Design Finite Automata for different Regular Expressions and Languages.
3.	To Construct context free grammar for various languages.
4.	To solve various problems of applying normal form techniques, push down automata and Turing Machines.
5.	Apply & understand Turning machine concepts.
6.	To use recursive and recursively enumerable languages concept.

Course Content:		
Unit-I	**FINITE AUTOMATA** Introduction, Deterministic Finite Automata (DFA) -Formal definition, simpler notations (state transition diagram, transition table), Nondeterministic Finite Automata (NFA)- Definition of NFA, language of an NFA, Equivalence of Deterministic and Nondeterministic Finite Automata, Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Minimization of Deterministic Finite Automata, Finite automata with output (Moore and Mealy machines).	**(6 Hrs)**
Unit-II	**REGULAR EXPRESSION** Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions. REGULAR GRAMMARS: Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA.	**(6 Hrs)**
Unit-III	**CONTEXT FREE GRAMMAR** Derivation Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings. Ambiguity in CFG's, Minimization of CFG's, CNF, GNF	**(6 Hrs)**
Unit-IV	**PUSHDOWN AUTOMATA** Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA	**(6 Hrs)**
Unit-V	**TURING MACHINE** Formal definition and behavior, Languages of a TM, TM as accepters, and TM as a computer of integer functions, Types of TMs.	**(6 Hrs)**
Unit-VI	**RECURSIVE AND RECURSIVELY ENUMERABLE LANGUAGES** Properties of recursive and recursively enumerable languages, The Halting problem, Undecidable problems about TMs. Context sensitive language and linear bounded automata (LBA), Chomsky hierarchy	**(6 Hrs)**
Textbook:		

1.	Introduction to Automata Theory, Languages, and Computation John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman. Pearson Publication

Reference Books:

1.	Elements of the Theory of Computation, Harry R. Lewis and Christos H. Papadimitriou.
2.	Automata and Computability, Dexter C. Kozen.
3.	Introduction to the Theory of Computation, Michael Sipser.
4.	Introduction to Languages and the Theory of Computation, John Martin.
5.	Five Computers and Intractability: A Guide to the Theory of NP Completeness, M. R. Garey and DS. Johnson.

Project Base Learning (Topics)

1.	Develop a tool to illustrate the algorithm for converting an arbitrary NFA to a DFA .
2.	Develop a tool to draw a transition diagram for any given DFA.
3.	Approximation algorithms
4.	Greedy algorithms.
5.	Enumeration of finite automata
6.	Enumeration of PDA
7.	Enumeration of Turing machines
8.	Ambiguous grammars
9.	Disambiguation of Grammars
10.	Enumeration of Context-free languages
11.	Enumeration of Turing machines
12.	Universal Turing machines.
13.	Randomized Turing machines
14.	NP Complete Algorithm
15.	Problem solvability using Reduction
16.	Design of TM to emulate a finite automata
17.	Design of TM to emulate a PDA
18.	Complexity analysis of encryption algorithms using TM.
19.	Design of TM to perform sorting
20.	Design TM to perform searching.

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – IV (2023 course)

COURSE: DESIGN AND ANALYSIS OF ALGORITHMS		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory :- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Practical : 25 Marks	Credits: 4
Course Pre-requisites: The students should possess the knowledge of Data Structures and Discrete Mathematics.		
Course Objective:		
1.	Understand and use asymptotic notation (Big O, Theta, and Omega) to measure the time and space complexity of algorithms.	
2.	Analyze recurring relations arising from algorithm analysis.	
3.	Compare and contrast the performance of different algorithms for the same problem.	
Course Outcomes: At the completion of the course, the students should be able to		
1.	Interpret the performance of algorithms using analysis techniques.	
2.	Illustrate the complexity of Divide and Conquer strategies.	
3.	Analyze and apply the complexity of Greedy Methods.	
4.	Describe the complexity of Dynamic Programming Approach.	

5.	Implement String-Matching Algorithms.	
6.	Explain backtracking, branch and bound techniques to deal with some hard problems.	

Course Content:		
Unit-I	**INTRODUCTION** Performance analysis, space, and time complexity Growth of function, Algorithm: Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behavior. Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem.	**(6 Hrs)**
Unit-II	**DIVIDE AND CONQUER** General method, Merge sort, Quick sort, Finding minimum and maximum algorithms and their Analysis, Binary search and Analysis, Strassen's Matrix multiplication.	**(6 Hrs)**
Unit-III	**GREEDY APPROACH** General Method, Single source shortest path: Dijkstra Algorithm, Fractional Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees: Kruskal and Prim's algorithms, Ford-Fulkerson algorithm, Huffman Coding	**(6 Hrs)**
Unit-IV	**DYNAMIC PROGRAMMING** General Method, Multistage graphs, all pair shortest path: Floyd Warshall Algorithm, Network Flow Algorithm, Assembly-line scheduling Problem, 0/1knapsack Problem, Travelling Salesperson problem	**(6 Hrs)**
Unit-V	**STRING MATCHING** String Matching Algorithms: The Naïve string-matching algorithm, The Rabin Karp algorithm, The Knuth-Morris-Pratt algorithm	**(6 Hrs)**
Unit-VI	**BACKTRACKING AND BRANCH AND BOUND** The General Method, the 8- Queens Problem, Sum of Subsets, Graph Coloring, and Hamiltonian Cycles. Branch and Bound: Least Cost (LC) Search, The15-puzzle Control abstraction of LC Search, Bounding, FIFO Branch and Bound, LC Branch and Bound.	**(6 Hrs)**
Textbook:		

1.	Fundamentals of Computer Algorithms", E. Horowitz and S. Sahni, Orient Black.
2.	"Introduction to Algorithms", T. H. Cormen, C. E. Leiserson and R. L. Rivest,PHI Learning Pvt. Ltd. (Originally MIT Press).
3.	"The Design and Analysis of Computer Algorithms", A. Aho, J. Hopcroft and J. Ullman, Pearson Education India.
4.	Computer Algorithms: Introduction to Design and Analysis, S. Baase, Pearson Education India.
5.	"The Art of Computer Programming", D. E. Knuth, Addison Wesley.

Reference Books:

1.	Elements of the Theory of Computation, Harry R. Lewis and Christos H. Papadimitriou.	
2.	Automata and Computability, Dexter C. Kozen.	
3.	Introduction to the Theory of Computation, Michael Sipser.	
4.	Introduction to Languages and the Theory of Computation, John Martin.	
5.	Five Computers and Intractability: A Guide to the Theory of NP Completeness, M. R. Garey and DS. Johnson.	

Project Base Learning (Topics)

1.	Design and develop a project for Search engine using data structures.
2.	Design and develop a project for Google form like application.
3.	Design and develop a project for shortest path calculation for travelling salesman Problem.
4.	Design and develop a project for finding keywords from the paragraph.
5.	Design and develop a project for Customer Billing system.
6.	Design and develop a project for word dictionary using search tree concept.
7.	Design and develop a project for salary calculation of employees based on performance.
8.	Design and develop a project for password recovery system
9.	Create a mini project to construct a game: Create Sudoku.

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – IV (2023 course)

COURSE: DATA WAREHOUSING AND MINING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory:- 03 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 3
Course Pre-requisites: Data Structures, Programming		
Course Objective:		
1.	To identify the significance of Data Warehousing and Mining.	
2.	To analyze data, choose relevant models and algorithms for respective applications.	
3.	To study web data mining.	
4.	To develop research interest towards advances in data mining.	
Course Outcomes: At the completion of the course, the students should be able to		
1.	Understand data warehouse fundamentals and design data warehouse with dimensional modelling and apply OLAP operations.	
2.	Understand data mining principles and perform Data preprocessing and Visualization.	
3.	Identify appropriate data mining algorithms to solve real world problems.	
4.	Apply appropriate data mining clustering algorithms to solve real world problems.	
5.	Apply and evaluate association rule mining	
6.	Describe complex information and social networks with respect to web mining.	

	Course Content:	
Unit-I	**INTRODUCTION TO DATA WAREHOUSE** Introduction to Data Warehouse, Data warehouse architecture, Data warehouse versus Data Marts, E-R Modeling versus Dimensional Modeling, Information Package Diagram, Data Warehouse Schemas; Star Schema, Snowflake Schema, Fact less Fact Table, Fact Constellation Schema. Update to the dimension tables. Major steps in ETL process, OLTP versus OLAP, OLAP operations: Slice, Dice, Rollup, Drilldown and Pivot	**(6 Hrs)**
Unit-II	**DATA PREPROCESSING** Data Mining Task Primitives, Architecture, KDD process, Issues in Data Mining, Applications of Data Mining, Data Exploration: Types of Attributes, Statistical Description of Data, Data Visualization, Data Preprocessing: Descriptive data summarization, Cleaning, Integration & transformation, Data reduction, Data Discretization and Concept hierarchy generation	**(6 Hrs)**
Unit-III	**CLASSIFICATION TECHNIQUES** Data Mining Task Primitives, Architecture, KDD process, Issues in Data Mining, Applications of Data Mining, Data Exploration: Types of Attributes, Statistical Description of Data, Data Visualization, Data Preprocessing: Descriptive data summarization, Cleaning, Integration & transformation, Data reduction, DataDiscretization and Concept hierarchy generation.	**(6 Hrs)**
Unit-IV	**CLUSTERING TECHNIQUES** Types of data in Cluster analysis, Partitioning Methods (k-Means, k-Medoids), Hierarchical Methods (Agglomerative, Divisive), Density Based clustering- DBSCAN.	**(6 Hrs)**
Unit-V	**FREQUENT SET MINING** Market Basket Analysis, Frequent Item sets, Closed Item sets, and Association Rule, Frequent Pattern Mining, Apriori Algorithm, Association Rule Generation, Improving the Efficiency of Apriori, Mining Frequent Item sets without candidate Generation, FP growth algorithm	**(6 Hrs)**
Unit-VI	**WEB MINING** Introduction, Web Content Mining: Crawlers, Harvest System,	**(6 Hrs)**

	Virtual Web View, Personalization, Web Structure Mining: Page Rank, Clever, Web Usage Mining.	

Textbook:		
1.	Paulraj Ponniah, " Data Warehousing: Fundamentals for IT Professionals", Wiley India.	
2.	Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 2nd edition.	
3.	M.H. Dunham, "Data Mining Introductory and Advanced Topics",	

Reference Books:		
1.	Reema Theraja, "Data warehousing", Oxford University Press 2009.	
2.	Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining",	
3.	Pearson Publisher 2nd edition.	
4.	Ian H. Witten, Eibe Frank and Mark A. Hall, "Data Mining", Morgan Kaufmann 3rd edition.	

Project Base Learning (Topics)	
1.	House Price Prediction
2.	Movie recommender System
3.	Heart Disease prediction
4.	credit card fraud detection
5.	Petrol Price Prediction
6.	Detecting phishing websites

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – IV (2023 course)

<table>
<tr><td colspan="3" align="center">**COURSE: FOUNDATION OF ARTIFICIAL INTELLIGENCE**</td></tr>
<tr><td>**TEACHING SCHEME:**</td><td>**EXAMINATION SCHEME:**</td><td>**CREDITS:**</td></tr>
<tr><td>Theory:- 03 Hours/ Week
Practical :- 02 Hours/ Week</td><td>Semester End Examination: 60 Marks
Internal Assessment: 40 Marks
Term Work : 25 Marks
Practical : 25 Marks</td><td>Credits: 4</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td colspan="3">**Course Pre-requisites:** Discrete mathematics, Data structures, Algorithms Analysis and Design.</td></tr>
<tr><td colspan="3">**Course Objective:**</td></tr>
<tr><td>1.</td><td colspan="2">Study the concepts of Artificial Intelligence.</td></tr>
<tr><td>2.</td><td colspan="2">Learn the methods of solving problems using Artificial Intelligence.</td></tr>
<tr><td>3.</td><td colspan="2">Learn the knowledge representation techniques, reasoning techniques and planning</td></tr>
<tr><td>4.</td><td colspan="2">Introduce the concepts of Expert Systems and machine learning.</td></tr>
<tr><td colspan="3">**Course Outcomes:** At the completion of the course, the students should be able to</td></tr>
<tr><td>1.</td><td colspan="2">Describe the concept of Artificial Intelligence, Intelligent agents and Learning agents.</td></tr>
<tr><td>2.</td><td colspan="2">Identify issues in problem solving and apply the appropriate search methods.</td></tr>
<tr><td>3.</td><td colspan="2">Use the appropriate search method and identify the constraints.</td></tr>
<tr><td>4.</td><td colspan="2">Describe and select the different knowledge representation methods.</td></tr>
<tr><td>5.</td><td colspan="2">Identify the components of planning for a particular System.</td></tr>
</table>

6.	Use appropriate domain knowledge and develop an Expert system	

Course Content:

Unit-I	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE** Introduction: Introduction to AI, Problems of AI, AI Techniques, Problem Formulation, Tic- Tac-Toe problem. Intelligent Agents: Structure of Intelligent Agents, Types of Agents, Agent Environments PEAS Representation for an Agent	**(6 Hrs)**
Unit-II	**SEARCH TECHNIQUES** Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best-first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search.	**(6 Hrs)**
Unit-III	**CONSTRAINTS SATISFACTION PROBLEMS AND GAME PLAYING** Local search for constraints Satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.	**(6 Hrs)**
Unit-IV	Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple fact in logic, Properties of WFF, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge	**(6 Hrs)**
Unit-V	**PROBABILISTIC REASONING** Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques	**(6 Hrs)**

Unit-VI	EXPERT SYSTEM	(6 Hrs)
	Rule based systems, Nonproduction systems: decision tree architectures, blackboard system architectures, neural network architectures. Types of learning, general learning model, learning by induction: generalization, specialization; learning by induction: generalization, specialization; Example of inductive learner.	

Textbook:	
1.	Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Pearson.
2.	E. Rich, K. Knight and S. Nair, Artificial Intelligence, McGraw Hill.
3.	Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education

Reference Books:	
1.	Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Pearson.
2.	E. Rich, K. Knight and S. Nair, Artificial Intelligence, McGraw Hill.
3.	Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education 2004

Project Base Learning (Topics)	
1.	Tic Tac Toe using AI Player
2.	Pac man game using AI
3.	Snake Game Using AI
4.	Chatbot
5.	AI for Climate Change
6.	Automated Attendance System

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – IV (2023 course)

COURSE: SKILL BASED COURSE – IV (ADVANCE PYTHON)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical :- 02 Hours/ Week	Term Work : 25 Marks Practical : 25 Marks	Credits: 1

Course Pre-requisites: The students should have knowledge of basics of statistics and python programming.

Course Objective: To develop analytical skills among the students using data analysis methods and Python.

Course Outcomes: At the completion of the course, the students should be able to

1.	To understand the predefined libraries in python.
2.	To explore the data wrangling technique with python.
3.	To discover the data aggregation and group operation in functions in python.
4.	To develop program for time series using built in functions in python.
5.	To recognize the data visualization concepts using python.
6.	To identify web scrapping concepts using python.

Course Content:

Unit-I	**NUMPY AND PANDAS** Creating NumPy arrays, Indexing and slicing in NumPy, creating multidimensional arrays, NumPy Data types, Array Attribute, Indexing and Slicing, creating array views copies, manipulating array shapes I/O	**(6 Hrs)**

	Basics of Pandas, Using multilevel series, Series and Data Frames, Grouping, aggregating, Merge Data Frames.	
Unit-II	**DATA WRANGLING & SK LEARN LIBRARY** Combining and Merging Datasets, Reshaping and Pivoting, Data Transformation, String Manipulation, Regular Expressions, sk learn library.	**(6 Hrs)**
Unit-III	**DATA AGGREGATION, GROUP OPERATIONS** Group By Mechanics, Data Aggregation, Group wise Operations and Transformations, Pivot Tables and Cross Tabulations.	**(6 Hrs)**
Unit-IV	**TIME SERIES** Time Series Basics, Data Ranges, Frequencies and Shifting.	**(6 Hrs)**
Unit-V	**DATA VISUALIZATION** Data visualization using python matplotllib and sea born library, also introduction tableau.	**(6 Hrs)**
Unit-VI	**WEB SCRAPPING** Introduction to web scrapping, libraries for web scrapping, Component for web scrapping.	**(6 Hrs)**

Textbook:	
1.	Programming Python, Mark Lutz.
2.	Python 3 for Absolute Beginners, Tim Hall and J-P Stacey.
3.	Beginning Python: From Novice to Professional, Magnus Lie Hetland. Edition, 2005

Reference Books:		
1.	Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data"O'Reilly Media	

Project Base Learning (Topics)	
1.	House Price Prediction
2.	Car price prediction
3.	Fake News Classification in Python.
4.	Plant disease detection
5.	Heart disease classification
6.	Stock price prediction

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – IV (2023 course)

COURSE: OPERATING SYSTEMS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory:- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Practical : 25Marks	Credits: 4

Course Pre-requisites: Any Programming Language

Course Objective:

1.	To learn the basic concepts of Operating Systems.
2.	To learn the mechanisms of OS to handle processes and threads and their communication.
3.	To learn the methods of process scheduling.
4.	To gain knowledge on Mutual exclusion, deadlock detection algorithms.
5.	To know the concept of memory management and virtual memory.
6.	To learn programmatically file management techniques.

Course Outcomes: At the completion of the course, the students should be able to

1.	To learn and apply the basic concept of operating system.
2.	To infer the concept of process and process state transition and concept of thread and multithreading.
3.	Understand the importance of scheduling and types of scheduling algorithms.
4.	To gain the knowledge of inter process communication strategies, concept of dead lock along with its avoidance.
5.	To analysis the memory management techniques, paging and segmentation.

6.	To understand the file management and disk management techniques	
Course Content:		
Unit-I	**INTRODUCTION** Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.	**(6 Hrs)**
Unit-II	**PROCESS MANAGEMENT** Processes: Definition, Process Relationship, Different states of a process, Process State transitions, Process Control Block (PCB), Context switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads	**(6 Hrs)**
Unit-III	**PROCESS SCHEDULING** Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time. Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time Scheduling : RM and EDF	**(6 Hrs)**
Unit-IV	**DEADLOCK** Inter-process Communication: Concurrent processes, precedence graphs, fork and join constructs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores. The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem. Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery. Deadlocks - prevention, avoidance, detection and recovery.	**(6 Hrs)**
Unit-V	**MEMORY MANAGEMENT** Memory Management: Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page	**(6 Hrs)**

	Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU)	
Unit-VI	I/O Hardware: I/O devices, Device controllers, Direct Memory Access, Principles of I/O. File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed),Free-space management (bit vector, linked list, grouping), directory implementation(linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C- SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks. Case study: UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, UNIX system calls.	**(6 Hrs)**

Textbook:	
1.	Operating System Concepts Essentials. Abraham Silber Schatz, Peter BaerGalvin and Greg Gagne.

Reference Books:	
1.	Operating Systems: Internals and Design Principles. William Stallings.
2.	Operating System: A Design-oriented Approach. Charles Patrick Crowley.
3.	Operating Systems: A Modern Perspective. Gary J. Nutt.
4.	Design of the UNIX Operating Systems. Maurice J. Bach.
5.	Understanding the Linux Kernel, Daniel Pierre Bovet, iraseC, ocraM
1.	Operating Systems: Internals and Design Principles. William Stallings.

Project Base Learning (Topics)	
1.	Virtual traffic management system using threads with semaphore to control traffic.
2.	Virtual memory management system.
3.	File system handling.
4.	A Client -Server application, use of IPC.
5.	A simple web browser.
6.	Device driver for some device.
7.	Design of mail system project.
8.	Design of RTOS for embedded system.

9.	Mini project on Linux Shell.
10.	Railway reservation system using scheduling

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – IV (2023 course)

COURSE: INDIAN KNOWLEDGE SYSTEM

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 02 Hours/ Week	Internal Assessment: 100 Marks	Credits: 2

Course Objective:

1.	To sensitize the students about Indian culture and civilization including its Knowledge System and Tradition.
2.	To help student to understand the knowledge, art and creative practices, skills, and values in ancient Indian system .
3.	To help to study the enriched scientific Indian heritage.
4.	To introduce the contribution from Ancient Indian system & tradition to modern science & Technology.

Course Outcomes: At the completion of the course, the students should be able to

1.	Concepts of Indian Knowledge System
2.	India's contribution in Philosophy and Literature
3.	India's involvement in Mathematics and Astronomy
4.	India's role in Medicine and Yoga
5.	India's influence in Sahitya
6.	Concepts of Indian Shastra

Course Content:

Unit-I	**INTRODUCTION TO INDIAN KNOWLEDGE SYSTEM** Definition, Concept and Scope of IKS, IKS based approaches on Knowledge Paradigm, IKS in ancient India and in modern India	**(4 Hrs)**
Unit-II	**PHILOSOPHY AND LITERATURE** Contributions by Maharishi Vyas, Manu, Kanad, Pingala, Parasar, Banabhatta, Nagarjuna and Panini in Philosophy and Literature.	**(4 Hrs)**

Unit-III	MATHEMATICS AND ASTRONOMY Contribution of Aryabhatta, Mahaviracharya, Bodhayan, Bhashkaracharya, Varahamihira and Brahmgupta in Mathematics and Astrononmy .	(4 Hrs)
Unit-IV	MEDICINE AND YOGA Major contributions of Charak, Susruta, Maharishi Patanjali and Dhanwantri in Medicine and Yoga .	(4 Hrs)
Unit-V	INTRODUCTION TO VEDAS, UPVEDAS, UPAVEDAS (Ayurveda, Dhanurveda, Gandharvaveda) Puran and Upnishad) and shad darshan (Vedanta, Nyaya.Vaisheshik, Sankhya, Mimamsa, Yoga, Adhyatma and Meditation)	(4 Hrs)
Unit-VI	SHASTRA Introduction to Nyaya, vyakarana, Krishi, Shilp, Vastu, Natya and Sangeet.	(4 Hrs)
Textbook:		
1.	Kapur K and Singh A.K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatvabodh of sankaracharya, Central chinmay mission trust, Bombay, 1995.	
2.	The Cultural Heritage of India. Vol.I. Kolkata:Ramakrishna Mission Publication, 1972.	
3.	Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008.	
4.	Dr. R. C. Majumdar, H. C. Raychaudhuri and Kalikinkar Datta: An Advanced History of India (Second Edition) published by Macmillan & Co., Limited, London, 1953.	
5.	Rao, N. 1970. The Four Values in Indian Philosophy and Culture. Mysore: University of Mysore.	
6.	Avari, B. 2016. India: The Ancient Past: A History of the Indian Subcontinent from c. 7000 BCE to CE 1200. London: Routledge.	
7.	Textbook on The Knowledge System of Bhārata by Bhag Chand Chauhan,	
8.	Histrory of Science in India Volume-1, Part-I, Part-II, Volume VIII, by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishan Mission Institute of Culture, Kolkata (2014).	

9.	Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al. Samskrit Bharati (2006).
10.	Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012).

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

B.Tech CSE (AIML) Semester V

Programme: B. Tech. Sem – V (2023 course)

COURSE: COMPILER CONSTRUCTION

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week Tutorial :- 01 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 4

Course Pre-requisites: The students should have knowledge of

1.	The students should have learnt Theory of Computation.
2.	Basic of the structure of any Programming Language and Grammars.
3.	Know the basics of Computer organization and Assembly Language Programming.

Course Objective: On completion of the course

1.	To study the Compiler Design Tools.
2.	To understand the Compiler for various Programming Languages.
3.	To perform code optimization and design code generator.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand compiler and various phases in compilation.
2.	Develop language specifications using context free grammars (CFG).
3.	Understand Parser and compare its various techniques.
4.	Construct symbol tables and generating intermediate code.
5.	Apply different code optimization techniques.
6.	Apply the skills on devising, selecting, and using tools and techniques towards compiler design.

Course Content:

Unit-I	**INTRODUCTION TO COMPILER AND LEXICAL ANALYSIS** Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, relating regular expressions and finite automata, scanner generator (lex, flex)	(6 Hrs)

Unit-II	**SYNTAX ANALYSIS**	**(6 Hrs)**
	Role of Parser- Parse Tree - Elimination of Ambiguity - Elimination of Left recursion, Elimination of Left factoring, Top down parsing, FIRST and FOLLOW, Top-Down Parsing - Recursive Descent Parsing – Non-Recursive Descent Parsing - Predictive Parsing – LL (1) Grammars.	
Unit-III	**BOTTOM UP PARSER & SEMANTIC ANALYSIS**	**(6 Hrs)**
	Operator grammars, Bottom-up parsing, Shift Reduce Parser, LR(O), SLR, CLR, LALR parsing Semantic Analysis: Attribute grammars, syntax directed definition, evaluation, and flow of attribute in a syntax tree.	
Unit-IV	**INTERMEDIATE CODE GENERATION**	**(6 Hrs)**
	Symbol Table: Basic structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, scope. Intermediate Code Generation: Variants of Syntax trees - Three Address Code- Types – Declarations - Procedures	
Unit-V	**CODE OPTIMIZATION**	**(6 Hrs)**
	Code Optimization Techniques, Loop optimizations- Principal Sources of Optimization -Introduction to Data Flow Analysis-Basic Blocks - Optimization of Basic Blocks - Peephole Optimization- The DAG Representation of Basic Blocks -Loops in Flow Graphs.	
Unit-VI	**CODE GENERATION**	**(6 Hrs)**
	Issues in the design of a code generator- Target Machine- Next-Use Information - Register Allocation and Assignment, Runtime Organization, Activation Record	

Textbook:	
1.	V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, Compilers: Principles, techniques, &tools, Second Edition, Pearson Education, 2007.
2.	K. D. Cooper and L. Torczon, Engineering a compiler, Morgan Kaufmann, 2nd edition, 2011.
3.	Steven S.Muchnick "Advanced Compiler design implementation", Elsevier Science India, 2003.

Reference Books:	
1.	Andrew A.Appel , Modern Compiler Implementation in Java, Cambridge University Press; 2ndedition, 2002.
2.	Allen Holub, Compiler Design in C, Prentice Hall, 1990
3.	Torbengidius Mogensen, Basics of Compiler Design, Springer, 2011.
Unit Test :	

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – V (2023 course)

COURSE: MACHINE LEARNING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Practical : 25 Marks	Credits: 4

Course Pre-requisites: The students should have knowledge of Probability and Statistics, Python Programming and Algorithms.

Course Objective: On completion of the course

1.	To understand and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
2.	Explore supervised and unsupervised learning paradigms of machine learning.
3.	To study the various probability & graphical based learning techniques

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand the fundamentals of developing machine learning models.
2.	Apply an appropriate machine learning model using regression and Decision tree.
3.	Apply suitable Machine learning models for a given Classification problem.
4.	Apply suitable Machine learning models for a given Clustering problem
5.	Demonstrate ensemble techniques to combine predictions from different models.
6.	Apply the dimensionality reduction techniques.

Course Content:

Unit-I	**INTRODUCTION TO MACHINE LEARNING** Machine Learning, Types of Machine Learning, Issues in Machine Learning, Application of Machine Learning, Steps in developing a Machine Learning Application. Training and Testing, Overfitting, Underfitting, Bias Variance trade-off.	**(6 Hrs)**

Unit-II	**LEARNING WITH REGRESSION AND DECISION TREE** Linear Regression, Multivariate Linear Regression, Logistic Regression. Classification: Decision Trees, ID3, Constructing Decision Trees using Gini Index, Classification and Regression Trees (CART), Performance Metrics: Confusion Matrix, [Kappa Statistics], Sensitivity, Specificity, Precision, Recall, F1-measure, AUC -ROC curve.	**(6 Hrs)**
Unit-III	**LEARNING WITH CLASSIFICATION** K-Nearest Neighbour Classification, Naive Bayes classifiers, Bayesian classification, Support Vector Machine, SVM for linear and nonlinear classification, Basics of Kernel trick. Support Vector Regression, Multiclass Classification.	**(6 Hrs)**
Unit-IV	**LEARNING WITH CLUSTERING** Introduction to clustering with overview of distance metrics and major clustering approaches, Density Based Clustering: DBSCAN, CLIQUE, Graph Based Clustering: Clustering with minimal spanning tree Model based Clustering: Expectation Maximization Algorithm.	**(6 Hrs)**
Unit-V	**ENSEMBLE LEARNING** Understanding Ensembles, K-fold cross validation, Boosting, Stumping, XGBoost. Bagging, Subagging, Random Forest, Comparison with Boosting, Different ways to combine classifiers.	**(6 Hrs)**
Unit-VI	**DIMENSIONALITY REDUCTION** Curse of Dimensionality, Feature Selection and Feature Extraction, Dimensionality Reduction Techniques, Principal Component Analysis, Independent Component Analysis, Linear Discriminant Analysis, Singular Valued Decomposition.	**(6 Hrs)**
Textbook:		
1.	Tom M. Mitchell, ―Machine Learning‖ McGraw Hill.	
2.	Stephen Marsland, ―Machine Learning An Algorithmic Perspective‖, CRC Press.	
3.	Peter Harrington, ―Machine Learning n Action‖, Dream Tech Press.	
Reference Books:		

1.	Samir Roy and Chakraborty, ―Introduction to soft computing‖, Pearson Edition.
2.	Richard Duda, Peter Hart, David G. Stork, ―Pattern Classification‖, Second Edition, Wiley Publications

List Of Experiments

1.	Write a program to apply descriptive statistics on a data set.
2.	Write a program to pre-process the data.
3.	Write a program to implement Linear Regression.
4.	Write a program to implement Logistic Regression.
5.	Write a program to implement Decision Tree.
6.	Write a program to implement Random Forest, bagging and boosting
7.	Write a program to implement SVM.
8.	Write a program to implement Naïve Bayesian algorithm.
9.	Write a program to implement DBSCAN algorithm.
10.	Write a program to implement PCA.
11.	Case study based on any ML technique.

Project Base Learning (Topics)

1.	Sales Prediction
2.	Music Recommendation System
3.	Stock Prices Predictor
4.	Movie Recommender System
5.	Sentiment Analysi
6.	Loan Eligibility Prediction
7.	Passenger Survival Prediction
8.	Plant Species Identification
9.	Speech Emotion Recognition
10.	Taxi Demand Prediction
11.	Fake News Classification
12.	Resume Parser
13.	Text Classification
14.	Air Quality Index Analysis

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – V (2023 course)

COURSE: SOFTWARE ENGINEERING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Oral : 25 Marks	Credits: 4

Course Pre-requisites: The students should have basic knowledge of computer functions, applications and understanding of programming concepts for software development.

Course Objective: The main purpose of this course is to impart knowledge on the

1.	Basic principles of the software development life cycle.
2.	Requirement Gathering and Analysis for a project.
3.	Programming paradigms, software planning, Maintenance and Quality Management.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand the phases of Software Development Life Cycle and apply the appropriate model to develop software applications.
2.	Identify the requirements and implement appropriate software solutions for real-world problems.
3.	Understand the various steps in software planning and types of Estimations involved in software development.
4.	Apply the fundamentals of Software Design to design various UML diagrams.
5.	Compare the various Whitebox and Black box testing techniques.
6.	Evaluate different quality assessment models.

Course Content:

Unit-I	INTRODUCTION TO SOFTWARE ENGINEERING AND PROCESS MODELS Significance challenges and Software Myths in software engineering, software crisis Software Development Methodologies: Waterfall model, prototyping model, Incremental model, Evolutionary Model,	(6 Hrs)

	Spiral model, Agility, Agile Process models: Extreme Programming (XP), Adaptive Software Development (ASD), Scrum.	
Unit-II	**SOFTWARE REQUIREMENTS ENGINEERING AND ANALYSIS** Types of software requirements: Functional and non-functional requirements, Domain requirements, User requirements. Requirement Elicitation: Interviews, Brain Storming Sessions, Scenarios, Use-cases, Quality Function Deployment. Requirement Documentation: Characteristics of SRS, SRS document.	**(6 Hrs)**
Unit-III	**SOFTWARE PLANNING AND ESTIMATION** Management Spectrum, 3Ps (people, product and process) Process and Project metrics Software Project Estimation: Types of Estimation, LOC, FP, Halstead analysis, COCOMO, Specialized Estimation Techniques, Object based estimation, use-case based estimation. Project scheduling: Defining a Task Set for the Software Project, Timeline charts, Tracking the Schedule, Earned Value Analysis. Risk Identification and Assessment, RMMM. Change Management- Software configuration management (SCM).	**(6 Hrs)**
Unit-IV	**SOFTWARE DESIGN** Fundamental concepts of software design: Data Flow Diagrams, Coupling and Cohesion measures and types. Introduction to UML, UML Diagrams, Implementing UML scenario in programming environment.	**(6 Hrs)**
Unit-V	**SOFTWARE IMPLEMENTATION AND TESTING** Fundamental of testing, Error, Mistake, Bug, Fault and Failure, Types of Testing, Levels of Testing, Verification and validation, black box testing: Equivalence class partitioning, boundary value analysis, White box testing- Program Coverage Techniques. Unit Testing, Integration Testing, System Testing, Alpha Testing, Beta Testing, Acceptance Testing, Debugging Process and Approaches	**(6 Hrs)**
Unit-VI	**SOFTWARE MAINTENANCE AND QUALITY MANAGEMENT** Types of Maintenance, cost of maintenance, Reengineering, Reverse Engineering, Forward Engineering, Quality Concepts: Attributes of Software Quality, Quality Control, Cost of Quality, Software Quality Assurance. Six Sigma for Software Engineering. The ISO 9000 Quality Standards, Capability Maturity Model, Software Quality Assurance Plan, Software Reliability.	**(6 Hrs)**

Textbook:	
1.	Roger S, "Software Engineering – A Practitioner's Approach", Seventh Edition, Pressman, 2010.
2.	Pearson Edu, "Software Engineering By Ian Sommerville", 9th Edition, 2

Reference Books:	
1.	Kelkar S.A., ―Software Engineering, Prentice Hall of India Pvt Ltd, 2007
2.	Stephen R.Schach, Software Engineering, Tata McGraw-Hill Publishing Company Limited,2007
3.	Van Vliet, "Software Engineering: Principles And Practices"

List Of Experiment	
1.	Development of requirements specification document for a project.
2.	E-R Modeling for the project.
3.	Modeling Data Flow Diagrams.
4.	Creating Use case diagram and use case scenarios.
5.	State chart and Activity Modeling
6.	Creating Class diagram and Sequence diagram for the project.
7.	Estimation of Test Coverage Metrics and Structural Complexity
8.	Designing Test Suites
9.	Study design of Biometric Authentication software
10.	Selenium Testing with any online application

Project Base Learning (Topics)	
1.	ATM System
2.	Online Banking System
3.	Airline Reservation System
4.	Railway Reservation System
5.	Library Management System
6.	College Management System
7.	Hospital Management System
8.	Traffic Monitoring System
9.	Hotel Management System
10.	Bus Ticket Reservation System

11.	Online Shopping System

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – V (2023 course)

COURSE: COMPUTER NETWORKS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Practical : 25 Marks	Credits: 4

Course Pre-requisites: The students should have knowledge of	
1.	Basic Electronics and Logic Design and working of Various Networking Device.

Course Objective:	
1.	To gain core knowledge of Computer Networks and Network protocols and IP addressing
2.	To acquire knowledge of Data Link layer services and Basic Network Devices
3.	To understand the issues and challenges in Computer Network

Course Outcomes: At the completion of the course, the students should be able to	
1.	Explore the fundamental concepts computer networking and compare ISO – OSI model with TCP/IP model.
2.	Study and Understand Various Network Device working and Functions.
3.	Analyze Data Link layer protocols and congestion control algorithms with Channel Allocations.
4.	Design the network using IP addressing and sub netting / super netting schemes.
5.	Demonstrate the knowledge of Transport layer functions and protocols like TCP and UDP
6.	Apply various applications layer protocols

Course Content:		
Unit-I	**BASICS OF COMPUTER NETWORKS** Introduction to Computer Network, Types of Computer Network, Ad-hoc Network, Client-Server Architectures, OSI Model and TCP/IP Model,	**(6 Hrs)**

Unit-II	**PHYSICAL LAYER**	**(6 Hrs)**
	Introduction to Communication System, Network Topologies, digital Communication, Electromagnetic Spectrum, Transmission Media, Wireless Transmission, Circuit and Packet Switching.	
Unit-III	**DATA LINK LAYER**	**(6 Hrs)**
	Design issues DLL , Error detection and Correction, elementary data link protocols, sliding window protocols, HDLC. THE MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols, CSMA / CD protocol and its performance, PPP details., Ethernet, Data Link Layer switching	
Unit-IV	**NETWORK** Layer	**(6 Hrs)**
	Design issue and IP Protocol, IPv4 and IPv6 addressing schemes, Subnetting, Address mapping – ARP, RARP, BOOTP and DHCP– Delivery, Routing Protocols: Distance Vector, Link State, Path Vector, Routing in Internet: RIP, OSPF, BGP.	
Unit-V	**TRANSPORT LAYER**	**(6 Hrs)**
	Transport layer Service, Transport layer protocols for flow control, Elements of Transport Protocols, Multiplexing, Congestion Control, Example protocols: UDP, TCP.	
Unit-VI	**APPLICATION** LAYER	**(6 Hrs)**
	Application layer paradigms, Application layer protocols, Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Email: SMTP, MIME, POP3, Webmail, FTP, TELNET, Bluetooth.	
Textbook:		
1.	A.S. Tanenbaum, Computer Networks, Pearson Education, (4e) ..	
Reference Books:		
1.	B.A. Forouzan, Data Communications and Networking, TMH (5e)	
2.	Douglas E. Comer: Computer Network & Internet, Addison Wesley.	
3.	James F. Kurose & K W Ross: Computer Networking: A Top-Down Approach, Pearson Education (LPE)	
List of Experiments:		

1.	Use basic networking commands (eg: ping, tracert, nslookup, netstat, ARP, RARP, ip, ifconfig, dig, route, etc) using Linux Command Prompt
2.	Build a simple network topology and configure it for static routing protocol using packet tracer using Cisco Packet Tracer
3.	Implement Stop and wait protocol / sliding window (selective repeat / Go back N). Using Netsim
4.	Setup a network and configure IP addressing, subnetting, Masking using CISCO Packet Tracer.
5.	Simulate congestion control (leaky bucket / token bucket) using C code/Netsim
6.	Implement TCP or UDP Sockets using Java
7.	Perform Remote login using Telnet server/ SSH server using Linux Command Prompt
8.	Using nestat and route commands of Linux, do the following: View current routing table Add and delete routes Change default gateway

Project Base Learning (Topics)	
1.	Study on Bluetooth protocol stack
2.	Implement the Hamming code using Java
3.	Implement Stop and wait protocol / sliding window (selective repeat / Go back N). Using Netsim
4.	Setup a network and configure IP addressing, subnetting, Masking using CISCO Packet Tracer.
5.	Implement TCP or UDP Sockets using Java
6.	Perform File Transfer and Access using FTP commands
7.	Perform Remote login using Telnet server/ SSH server using Linux Command Prompt
8.	Set up multiple IP addresses on a single LAN.
9.	Using nestat and route commands of Linux, do the following: • View current routing table • Add and delete routes • Change default gateway
10.	Use Wireshark to understand the operation of TCP/IP layers

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – V (2023 course)

COURSE: SKILL BASED COURSE –V (R PROGRAMMING)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical :- 02 Hours/ Week	Term Work : 25 Marks Practical : 25 Marks	Credits: 1

Course Pre-requisites: The students should have knowledge of probability and statistics and Programming language.	
Course Objective: On completion of the course	

1.	The student will be familiar with R Studio and its features essential for performing various R operations.
2.	The student will be able to understand and perform data analytics using R program.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand the Fundamentals of R
2.	Apply different Data structures in R.
3.	Understand List and different functions related to it.
4.	Perform Data Manipulation using R.
5.	Apply different descriptive statistics in R.
6.	Apply Knowledge of R for Regression.

Course Content:

Unit-I	**INTRODUCTION TO R** Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations.	**(4 Hrs)**
Unit-II	**CONTROL STRUCTURES AND VECTORS** Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes. Vectors: Generating sequences, Vectors and subscripts,	**(4 Hrs)**

	Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations.	
Unit-III	**LIST AND DATA FRAMES** Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations.	**(4 Hrs)**
Unit-IV	**MANIPULATING DATA IN R** Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() File Handling in R language, CSV Files, Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() ,Writing into a CSV File, Reading the Excel file. Merging Data frames merge() – Melting and Casting data melt(), cast().Sorting and aggregation on Data frames.	**(4 Hrs)**
Unit-V	**STATICS WITH R** Descriptive Statistics: Data Range, Frequencies, Mode, Mean and Median: Mean Applying Trim Option, Applying NA Option, Median, Mode, Standard Deviation, Correlation, Spotting Problems in Data, Random Forest	**(4 Hrs)**
Unit-VI	**REGRESSION AND CLASSIFICATION IN R** Decision Tree, Normal and Binomial distributions, Time Series Analysis, Linear and Multiple Regression, Logistic Regression.	**(4 Hrs)**
Textbook:		
1.	Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014	
2.	Venables , W.N.,and Ripley,"S programming", Springer, 2000.	
Reference Books:		
1.	Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014	

List Of Experiments	
1.	Perform installation of R and Execute basic operations using R package.
2.	Implement R-Loops with different examples.
3.	Implement different data structures in R(Vectors ,Lists ,Data Frames)
4.	R Program to Implement Vector arithmetic and logical operations.
5.	Implement data frames in R.
6.	Write a program to join columns and rows in a data frame using c bind () and r bind () in R.
7.	Write a program to read a csv file and analyze the data in the file in R.
8.	Create a data set and do statistical analysis on the data using R.
9.	Write R program to find Correlation and Covariance.
10.	Write R program for Regression Modeling.

Programme: B. Tech. Sem – V (2023 course)

COURSE: ENVIRONMENTAL STUDIES

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 04 Hours/ Week	Semester End Examination: **40+ 20 Marks Internal Assessment: ***30+10 Marks	Credits: 4

** 1. ESE: a. 40 Marks (MCQ based end of semester/term university examination, for Units I to VIII)

       b. 20 Marks (Case Studies and Field Work report and presentation in a group, for Unit IX)

*** 2. IA: a. 30 Marks (Internation assessments comprising of Assignments/Seminars/Class work/Tests/projects, etc, for Unit I to VIII)

       b. 10 Marks - Attendance for Unit I to VIII

Course Outcomes: At the completion of the course, the students should be able to

1.	Appreciate the historical context of human interactions with the environment and Gain insights into the international efforts to safeguard the Earth's environment and resources
2.	Understand the concept of natural resources; identify types of natural resources, their distribution and use with special reference to India. Discuss the factors affecting the availability of natural resources, their conservation and management. Explain sustainable development, its goals, targets, challenges and global strategies for sustainable development.
3.	Develop a critical understanding of the environmental issues of concern Understand the concepts of spatial and temporal scales and their importance Understand the sectoral effects on the local, regional, and global environmental issues.
4.	Understand the concepts of ecosystems, biodiversity and conservation. Describe the main types of ecosystems and their distribution in India and the world. Discuss the factors impacting biodiversity loss and ecosystem degradation in India and the world.

	Explain major conservation strategies taken in India	
5.	Develop an understanding of pollution and its types. Learn about sources of different kinds of pollution. Sensitize themselves to adverse health impacts of pollution	
6.	Gain a comprehensive knowledge of climate change, its science and response measures Have an overview of national and global efforts to address climate change adaptation and mitigation.	
7.	Develop a critical understanding of the complexity of environmental management. Understand broad aspects of environmental management systems. Understand different methods of assessing environmental quality and associated risks	
8.	Learn about how the nations of the world work together for the environment. Learn about the major international treaties and our country's stand on and responses to the major international agreements. Learn about major international institutions and programmes and the role played by them in the protection and preservation of the environment.	

Course Content:

Unit-I	**Humans and the Environment** The man-environment interaction: Humans as hunter-gatherers; Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment, Indic Knowelege and Culture of sustainability; Middle Ages and Renaissance; Industrial revolution and its impact on the environment; Population growth and natural resource exploitation; Global environmental change. Environmental Ethics and emergence of environmentalism: Anthropocentric and eco-centric perspectives (Major thinkers); The Club of Rome- Limits to Growth; UN Conference on Human Environment 1972;World Commission on Environment and Development and the concept of sustainable development; Rio Summit and subsequent international efforts	**(4 Hrs)**

Unit-II	**Natural Resources and Sustainable Development** Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, renewable and non-renewable. Biotic resources: Major type of biotic resources- forests, grasslands, wetlands, wildlife and aquatic (fresh water and marine); Microbes as a resource; Status and challenges. Water resources: Types of water resources- fresh water and marine resources; Availability and use of water resources; Environmental impact of over-exploitation, issues and challenges; Water scarcity and stress; Conflicts over water. Soil and mineral resources: Important minerals; Mineral exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation. Energy resources: Sources of energy and their classification, renewable and non-renewable sources of energy; Conventional energy sources- coal, oil, natural gas, nuclear energy; Non-conventional energy sources- solar, wind, tidal, hydro, wave, ocean thermal, geothermal, biomass, hydrogen and fuel cells; Implications of energy use on the environment. Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs.	**(6 Hrs)**
Unit-III	**Environmental Issues: Local, Regional and Global** Environmental issues and scales: Concepts of micro-, meso-, synoptic and planetary scales; Temporal and spatial extents of local, regional, and global phenomena. Pollution: Impact of sectoral processes on Environment; Types of Pollution- air, noise, water, soil, thermal, radioactive; municipal solid waste, hazardous waste; transboundary air pollution; acid rain; smog. Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Biodiversity loss: past and current trends, impact. Global change: Ozone layer depletion; Climate change. Disasters – Natural and Man-made (Anthropogenic)	**(6 Hrs)**
Unit-IV	**Conservation of Biodiversity and Ecosystems** Biodiversity and its distribution: Biodiversity as a natural resource; Levels and types of biodiversity; Biodiversity in India and the world;	**(6 Hrs)**

	Biodiversity hotspots; Species and ecosystem threat categories. Ecosystems and ecosystem services: Major ecosystem types in India and their basic characteristicsforests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and their significance. Threats to biodiversity and ecosystems: Land use and land cover change; Commercial exploitation of species; Invasive species; Fire, disasters and climate change. Major conservation policies: in-situ and ex-situ conservation approaches; Major protected areas; National and International Instruments for biodiversity conservation; the role of traditional knowledge, community-based conservation; Gender and conservation.	
Unit-V	**Environmental Pollution and Health** Understanding pollution: Production processes and generation of wastes; Assimilative capacity of the environment; Definition of pollution; Point sources and non-point sources of pollution. Air pollution: Sources of air pollution; Primary and secondary pollutants; Criteria pollutants- carbon monoxide, lead, nitrogen oxides, ground-level ozone, particulate matter and sulphur dioxide; Other important air pollutants- Volatile Organic compounds (VOCs), Peroxyacetyl Nitrate (PAN), Polycyclic aromatic hydrocarbons (PAHs) and Persistent organic pollutants (POPs); Indoor air pollution; Adverse health impacts of air pollutants; National Ambient Air Quality Standards. Water pollution: Sources of water pollution; River, lake and marine pollution, groundwater pollution; water quality Water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life. Soil pollution and solid waste: Soil pollutants and their sources; Solid and hazardous waste; Impact on human health. Noise pollution: Definition of noise; Unit of measurement of noise pollution; Sources of noise pollution; Noise standards; adverse impacts of noise on human health. Thermal and Radioactive pollution: Sources and impact on human health and ecosystems.	**(6 Hrs)**
Unit-VI	**Climate Change: Impacts, Adaptation and Mitigation**	**(6 Hrs)**

	Understanding climate change: Natural variations in climate; Structure of atmosphere; Anthropogenic climate change from greenhouse gas emissions– past, present and future; Projections of global climate change with special reference to temperature, rainfall, climate variability and extreme events; Importance of 1.5 °C and 2.0 °C limits to global warming; Climate change projections for the Indian sub-continent. Impacts, vulnerability and adaptation to climate change: Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Impacts on animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment; Adaptation vs. resilience; Climate-resilient development; Indigenous knowledge for adaptation to climate change. Mitigation of climate change: Synergies between adaptation and mitigation measures; Green House Gas (GHG) reduction vs. sink enhancement; Concept of carbon intensity, energy intensity and carbon neutrality; National and international policy instruments for mitigation, decarbonizing pathways and net zero targets for the future; Energy efficiency measures; Renewable energy sources; Carbon capture and storage, National climate action plan and Intended Nationally Determined Contributions (INDCs); Climate justice.	
Unit-VII	**Environmental Management** Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights; Introduction to environmental legislations on the forest, wildlife and pollution control. Environmental management system: ISO 14001 Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis Environmental audit and impact assessment; Environmental risk assessment Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Ecomark scheme.	**(6 Hrs)**
Unit-VIII	Environmental Treaties and Legislation An overview of instruments of international cooperation; bilateral and multilateral agreements; conventions and protocols; adoption,	**(6 Hrs)**

signature, ratification and entry into force; binding and nonbinding measures; Conference of the Parties (COP) Major International Environmental Agreements: Convention on Biological Diversity (CBD); Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-sharing; Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); Ramsar Convention on Wetlands of International Importance; United Nations Convention to Combat Desertification (UNCCD); Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol on Substances that Deplete the Ozone Layer and the Kigali Amendment; Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; Stockholm Convention on Persistent Organic Pollutants; Minamata Convention on Mercury; United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement; India's status as a party to major conventions Major Indian Environmental Legislations: The Wild Life (Protection) Act, 1972; The Water (Prevention and Control of Pollution) Act, 1974; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Environment (Protection) Act, 1986; The Biological Diversity Act, 2002; The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; Noise Pollution (Regulation and Control) Rules, 2000; Industry-specific environmental standards; Waste management rules; Ramsar sites; Biosphere reserves; Protected Areas; Ecologically Sensitive Areas; Coastal Regulation Zone; Status phase-out of production and consumption of Ozone Depleting Substances by India; National Green Tribunal; Some landmark Supreme Court judgements Major International organisations and initiatives: United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN),World Commission on Environment and Development (WCED), United Nations Educational, Scientific

	and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC), and Man and the Biosphere (MAB) programme.	
Unit-IX	**Case Studies and Field Work** The students are expected to be engaged in some of the following or similar identified activities: • Discussion on one national and one international case study related to the environment and sustainable development. • Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report. • Participation in plantation drive and nature camps. • Documentation of campus biodiversity. • Campus environmental management activities such as solid waste disposal, water Management and sanitation, and sewage treatment.	**(30 Hrs)**

Textbook:	
1.	Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.
2.	Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future.10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson.
3.	Harper, Charles L. (2017) Environment and Society, Human Perspectives on Environmental Issues 6th Edition. Routledge
4.	Bawa, K.S., Oomen, M.A. and Primack, R. (2011) Conservation Biology: A Primer for South Asia. Universities Press.

Reference Books:		
1.	Masters, G. M., & Ela, W. P. (2008). Introduction to environmental engineering and science (No. 60457). Englewood Cliffs, NJ: Prentice Hall.	
2.	Adenle A., Azadi H., Arbiol J. (2015). Global assessment of technological innovation for climate change adaptation and mitigation in developing world, Journal of Environmental Management, 161 (15): 261-275.	

3.	Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press.
4.	Ministry of Environment, Forest and Climate Change (2019) A Handbook on International Environment Conventions & Programmes. https://moef.gov.in/wp-content/uploads/2020/02/convention-V-16-CURVE-web.pdf

Unit Test :

Unit Test – I	Unit I, II, III, IV
Unit Test – II	Unit V, VI,VII,VIII

Programme: B. Tech. Sem – V (2023 course)

COURSE: INTERNET OF THINGS(PEC-I)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week	Semester End Examination : 60 Marks Internal Assessment : 40 Marks	Credits: 3

Course Pre-requisites: The students should have knowledge of Networking Concepts and Python Programming.

Course Objective: On completion of the course

1.	To understand Conceptual Framework of Internet of Things (IoT) and types of sensors.
2.	To understand levels of the IoT architectures and to correlate the connection of smart objects and IoT access technologies.
3.	To explore network layer and application layer protocols for IoT and apply concepts of IoT to design real-world applications.

Course Outcomes: At the completion of the course, the students should be able to

1.	Describe the Characteristics and Conceptual Framework of IoT
2.	Differentiate between the levels of the IoT architectures.
3.	Interpret sensor network and its components
4.	Analyze the IoT access technologies
5.	Illustrate various protocols at network layer and application layer for IoT.
6.	Analyze different application of IoT

Course Content:

Unit-I	**INTRODUCTION TO IOT** Introduction to IoT- Defining IoT, Characteristics of IoT, Conceptual Framework of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs, Basics of networking Communication protocol, wireless sensor networks. Convergence of IT and OT, IoT Challenges, IoT protocol vs Web Protocol stack	**(4 Hrs)**

Unit-II	**IOT NETWORK ARCHITECTURE AND DESIGN** The IoT World Forum (IoTWF) Standardized Architecture: Layer 1-7, IT and OT Responsibilities in the IoT Reference Model, A Simplified IoT Architecture, The Core IoT Functional Stack: Layer 1-3, Analytics Versus Control Applications, Data Versus Network Analytics Data Analytics Versus Business Benefits IoT Data Management and Compute Stack: Fog Computing, Edge Computing, The Hierarchy of Edge, Fog, and Cloud.	**(6 Hrs)**
Unit-III	**SMART OBJECTS IOT** Sensors, Actuators, and Smart Objects, Sensors, Actuators, Micro-Electro-Mechanical Systems , Smart Objects: A Definition, Trends in Smart Objects, Sensor Networks, Wireless Sensor Networks (WSNs), Communication Protocols for WSN, RFID	**(4 Hrs)**
Unit-IV	**CONNECTING SMART OBJECTS** Communications Criteria, IoT Access Technologies: Standardization and Alliances, Physical Layer, MAC Layer, Topology, Security and Conclusion of IEEE 802.15.4, IEEE 802.15.4g and 802.15.4e , IEEE 802.11ah, LoRaWAN , and NB-IoT ,LTE	**(8 Hrs)**
Unit-V	**IOT NETWORK LAYER AND APPLICATION PROTOCOLS** The Business Case for IP, The Key Advantages of Internet Protocol, Adoption or Adaptation of the Internet Protocol, The Need for Optimization, Constrained Nodes, Constrained Networks IP Versions, Optimizing IP for IoT From 6LoWPAN to 6Lo, , 6TiSCH , RPL , IoT Application Layer Protocols, CoAP, MQTT, AMQP	**(8 Hrs)**
Unit-VI	**SECURING IOT** Applications of IoT: Home Automation. Smart Cities, Smart Roads, Structural Health Monitoring, Surveillance Smart Environment – Weather Monitoring, Air Pollution Monitoring, Noise Smart Agriculture – Smart Irrigation, Green House Control Smart Health & Lifestyle – Health & Fitness Monitoring, Wearable Electronics.	**(6 Hrs)**

Textbook:	
1.	Arsheep Bahga (Author), Vijay Madisetti, Internet Of Things: A Hands-On Approach Paperback, Universities Press, Reprint 2020
2.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, IoT Fundamentals Networking Technologies, Protocols, and Use Cases for the Internet of Things CISCO

Reference Books:		
1.	Pethuru Raj, Anupama C. Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases by , CRC Press.	
2.	Raj Kamal, Internet of Things, Architecture and Design Principles, McGraw Hill Education, Reprint 2018.	
3.	Perry Lea, Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security, Packt Publications, Reprint 2018.	

Project Base Learning (Topics)

1.	Automated Washroom Light Using IR Sensors
2.	Joystick-Controlled Industrial Automation System
3.	Arduino-based Real-Time Digital Clock With Temperature Display
4.	Smart GPS Tracker Using Arduino
5.	Flash Twenty LEDs Using Arduino
6.	Alarm Clock Radio Using Arduino
7.	Arduino-Based Wireless Frequency Meter
8.	Arduino-Based Window Alarm Annunciator
9.	Noise Detector with Automatic Recording System
10.	Humidity & Temperature Monitoring
11.	Automated Plant Watering System
12.	Home Automation Using an Android Device
13.	Build A Clap and Gesture-Controlled Robot
14.	Earthquake Sensor
15.	DC Motor Starter Using Arduino Uno Board

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – V (2023 course)

COURSE: IMAGE PROCESSING(PEC-I)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 3

Course Pre-requisites: The students should have knowledge of mathematics, programming skills such as python, digital electronics basics.

Course Objective: On completion of the course

1.	To teach the fundamentals and mathematical models in digital image processing with quality enhancement of image through filtering operations
2.	To teach the students image morphology and restoration techniques and expose the students to segmentation techniques in image processing
3.	To teach the techniques of extracting image attributes like regions and shapes and apply classification and recognition algorithms for machine vision

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand fundamentals of image processing.
2.	Enhance the quality of images using spatial and frequency domain techniques for image enhancement.
3.	Apply image morphology and restoration techniques.
4.	Understand image segmentation techniques based on principle of discontinuity and similarity using various algorithms.
5.	Apply boundaries and shapes using standard techniques.
6.	Apply classification methods to classify the objects.

Course Content:

Unit-I	DIGITAL IMAGE FUNDAMENTALS AND POINT PROCESSING Introduction –Steps in Digital Image Processing, concept of spatial and intensity resolution, Relationships between pixels, Point Processing : Image Negative, Log Transform, Power Law transform, Bit plane	(4 Hrs)

	slicing, Contrast stretching , Histogram equalization and Histogram Specification	
Unit-II	**IMAGE ENHANCEMENT** Spatial Domain filtering ,Linear Filters-Averaging filter, Order-Statistic Filters- Median filter, Application of Median filtering for Noise removal Sharpening Spatial Filters- The Laplacian, Unsharp Masking and Highboost Filtering, Using First-Order Derivatives —The Gradient-Sobel, Prewitt and Roberts, Frequency Domain Filtering: Frequency Domain Filtering Fundamentals, Frequency domain Image Smoothing and sharpening filter - Ideal, Butterworth , Gaussian	**(6 Hrs)**
Unit-III	**IMAGE MORPHOLOGY AND RESTORATION** Morphology: Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transformation, Boundary extraction , Hole filling, Thinning and thickening,Restoration:A Model of the Image Degradation/Restoration Process, Noise models, Removal periodic noise, Principle of Inverse filtering	**(4 Hrs)**
Unit-IV	**IMAGE SEGMENTATION** Point, Line, and Edge Detection: Detection of Isolated Points, Line detection, edge models, Canny's edge detection algorithm , Edge linking : Local processing and boundary detection using regional processing (polygonal fitting) , Thresholding : Foundation, Role of illumination and reflectance, Basic global thresholding , Region Based segmentation: Region Growing, Region Splitting and merging	**(8 Hrs)**
Unit-V	**INTRODUCTION TO MACHINE VISION AND DESCRIPTORS** Principle of machine vision , real world applications, chain code, simple geometric border representation, Fourier Transform of boundaries, Boundary description using segment sequences , Introduction to Texture, co-occurrence matrix	**(8 Hrs)**
Unit-VI	**MACHINE VISION ALGORITHMS** Knowledge representation, Classification Principles, Classifier setting, Classifier Learning, Confusion Matrix , K-means clustering algorithm, Introduction, bays decision theory continuous case, two category classification, Bayesian classifier ,Support vector machine	**(6 Hrs)**
Textbook:		

1.	Milan Sonka ,Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" Cengage Engineering, 3rd Edition, 2013
2.	Gonzales and Woods, "Digital Image Processing", Pearson Education, India, Third Edition,
3.	R. O. Duda and P. E. hart, Pattern classification and scene analysis, Wiley Interscience publication
4.	Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006

Reference Books:

1.	Anil K.Jain, "Fundamentals of Image Processing", Prentice Hall of India, First Edition, 1989.
2.	W Pratt, "Digital Image Processing", Wiley Publication, 3rd Edition, 2002
3.	Forsyth and Ponce, Computer vision: A modern approach, PHI
4.	Frank Y Shish ,Image Processing and Pattern Recognition: Fundamentals and Techniques, Wiley Wiley-IEEE Press, 2010

Project Base Learning (Topics)

1.	Object detection using yolo
2.	Image Caption Generator
3.	Driver Drowsiness Detection
4.	Face Swapping using openCV and dLib
5.	Pedestrian detection
6.	Face emotion recognition system
7.	Traffic Sign Recognition
8.	Road Lane Detection
9.	Vehicle counting and classification
10.	Image Forgery

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – V (2023 course)

COURSE: DATA VISUALIZATION(PEC-I)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: - 03 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 3

Course Pre-requisites: Basics of spreadsheet, Python programming

Course Objective: On completion of the course

1.	Students will understand the mechanism of Data visualization
2.	Describe the functionality of current implementation of Data Visualization and Reporting.
3.	Students will create various visualization using tableau.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand fundamentals of data visualization concepts.
2.	Apply data visualization stages on chosen data.
3.	Evaluate various data visualization techniques
4.	Describe how effectively a visualization conveys target data.
5.	Perform data customization using parameters in Tableau.
6.	Understand Current trends in data visualization.

Course Content:

Unit-I	**INTRODUCTION TO VISUALIZATION** Relationship between Visualization and Other Fields -The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Preprocessing - Data Sets, Introduction to tools for data visualization, Comparison of tools.	**(6 Hrs)**

Unit-II	**FOUNDATIONS FOR VISUALIZATION** Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical Perspective - Taxonomies -Experimental Semiotics based on Perception Gibson 's Affordance theory – A Model of Perceptual Processing.	**(6 Hrs)**
Unit-III	**VISUALIZATION TECHNIQUES** Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three-Dimensional Data - Dynamic Data - Combining Techniques. Geospatial Data: Visualizing Spatial Data - Visualization of Point Data - Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization, Multivariate Data: Point-Based Techniques - Line Based Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and Networks-Displaying Arbitrary Graphs/Networks.	**(6 Hrs)**
Unit-IV	**INTRODUCTION TO TABLEAU** Dive into Tableau, Connecting Data Sources, Tableau Generated Fields, Data Manipulation in Tableau, Working with Dates in Tableau Data Customization with Calculations: Adding Dynamism to a View with Parameters, Geographical Analysis & Maps, Creating Visualizations, Adding Statistics to Data, Formatting & Annotation, Dashboards & Stories	**(6 Hrs)**
Unit-V	**INTERACTION CONCEPTS AND TECHNIQUES** Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations - Extended Text Visualizations Interaction Concepts: Interaction Operators - Interaction Operands and Spaces - A Unified Framework. Interaction Techniques: Screen Space - Object-Space -Data Space -Attribute Space- Data Structure Space - Visualization Structure – Animating Transformations -Interaction Control	**(6 Hrs)**
Unit-VI	**CURRENT TRENDS** Design – Virtual Reality: Tools used for Creation of Virtual Reality, Interactive Medical Application – Tactile Maps for visually challenged	**(6 Hrs)**

People – Animation Design for Simulation – Integrating Spatial and Nonspatial Data – Innovating the Interaction, Visualization on social media, Real time visualization for Business applications, Advances in data visualization using AI and ML.

Textbook:

1.	Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
2.	Colin Ware, "Information Visualization Perception for Design", 2nd edition, Margon Kaufmann Publishers, 2004.
3.	Robert Spence "Information visualization – Design for interaction", Pearson Education, nd Edition, 2007.
4.	Alexandru C. Telea, "Data Visualization: Principles and Practice," A. K. Peters Ltd,2008

Reference Books:

1.	Joerg Osarek, "Virtual Reality Analytics", Gordon"s Arcade, 2016.
2.	https://www.tableau.com/products/techspecs
3.	https://www.tableau.com/tft/activation
4.	Visualization Analysis & Design by Tamara Munzner (2014) (ISBN 9781466508910)

Project Base Learning (Topics)

1.	Develop a system to apply data customization with calculations.
2.	Design Dashboard for Market Campaign analysis.
3.	Apply geographical analysis for any data set.
4.	Design dashboard for given Crime Analysis dataset.
5.	Design stories by using data visualization.
6.	Design Dashboard for Covid-19 analysis.
7.	Design Dashboard for Customer churn analysis
8.	Design Dashboard for Cricket dataset.
9.	Design Dashboard for Sale forecast analysis
10.	Design Dashboard for supply chain dataset.

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

B.Tech CSE (AIML) Semester VI

Programme: B. Tech. Sem – VI (2023 course)

COURSE: DEEP LEARNING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work : 25 Marks Practical : 25 Marks	Credits: 4

Course Pre-requisites: The students should have knowledge of Basic Probability and Statistics, Data Structures, Algorithms, Machine Learning.

Course Objective: On completion of the course

1.	Students will understand basics of Deep Learning
2.	Students will be able to build simple CNN and RNN architectures
3.	Student will understand basics of transfer learning and sequence to sequence modelling.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand the advanced concepts of machine learning and its application areas.
2.	Understand the basics of Neural Network and Activation functions.
3.	Apply CNN architecture to solve real time problems.
4.	Compare various Transfer learning architectures and their application areas.
5.	Apply basics of RNN and LSTM to solve real world problem.
6.	Analyze Auto-encoders and GAN with latest trends in Deep learning.

Course Content:

Unit-I	ADVANCED MACHINE LEARNING Introduction to Feature Engineering, Need for feature engineering, Feature Transformation and its types, Feature importance, Methods/techniques for feature importance, Issues with machine learning algorithms, Application areas of machine learning. Back propagation algorithm, exploding gradient and vanishing gradient problem, Gradient descent and variants.	(6 Hrs)

Unit-II	**INTRODUCTION TO DEEP LEARNING** Machine learning Vs Deep learning, Introduction to Neural network, Multilayer feed forward Network. Representation Learning, Activation functions – Sigmoid, Tanh, ReLU , LReLU , ERelu, Softmax limitations of activation functions, Loss functions – Squared Error loss, Cross Entropy and its variants, Optimizers in deep learning, Comparison of optimizers. Unsupervised Training of Neural Networks, Restricted Boltzmann Machines.	**(6 Hrs)**
Unit-III	**CONVOLUTIONAL NEURAL NETWORKS** Architecture overview, Convolution operation, Padding, Stride, Relation between input, output and filter size, CNN layers: Convolution layer, Pooling Layer, Flatten layer, Fully Connected layer, Weight Sharing in CNN, Types of Filters, Variants of basic Convolution function, Output layer. Regularization, types of Regularization, Optimizers and Loss Functions, Application of CNN for object detection, Image classification etc.	**(6 Hrs)**
Unit-IV	**TRANSFER LEARNING** Fundamentals of transfer learning, importance of transfer learning, Types of Transfer Learning, Fine-Tuning, Applications of Transfer learning ,Various transfer learning models: VGG-16, RESNET 50, Inception V3, Dense Net, Comparison of transfer learning models.	**(6 Hrs)**
Unit-V	**SEQUENCE MODELLING &RNNS** Recurrent Neural Networks, Bidirectional RNNs, Encoder-decoder sequence to sequence architectures, BPTT for training RNN, Long Short-Term Memory Networks. Applications of RNN,	**(6 Hrs)**
Unit-VI	**AUTO ENCODERS** Under complete Autoencoders, Regularized Autoencoders, stochastic Encoders and Decoders, Contractive Encoders. Deep Belief networks, Boltzmann Machines, Deep Boltzmann Machine, Generative Adversarial Networks. Recent Deep learning trends- Like: GRU.	**(6 Hrs)**
Textbook:		
1.	Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, 2017.	
2.	Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks" A press, 2018.	

3.	Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017

Reference Books:

1.	Buduma, N. and Locascio, N., —Fundamentals of deep learning: Designing next-generation machine intelligence algorithms" 2017. O'Reilly Media, Inc.".
2.	Douwe Osinga. —Deep Learning Cookbook‖, O'REILLY, SPD Publishers, Delhi
3.	François Chollet. —Deep learning with Python —(Vol. 361). 2018 New York: Manning

List Of Experiments

1.	Implement Machine algorithm for text dataset with parameter tuning for classification task, performance evaluation using various metrics.
2.	Implement simple Neural Network for image dataset for classification problem and performance evaluation using various metrics.
3.	Implement simple Neural network architecture for prediction of house prices.
4.	Deep learning Packages Basics: Tensorflow, Keras, Theano and PyTorch and implement a program to create a basic CNN architecture.
5.	Implement CNN for Face Recognition using standard public dataset.
6.	Perform Dimensionality reduction using CNN
7.	Implement Image classification using transfer learning models such as VGG-16, RESNET 50 etc.
8.	Perform Sentiment Analysis using LSTM on standard dataset.
9.	Perform Time series prediction using RNN
10.	Perform image generation using GAN for face image or disease dataset.

Project Base Learning (Topics)

1.	Classification with Multilayer perceptron using Scikit learn with parameter tuning.
2.	Classification of Image dataset using MLP.
3.	Fingerprint Recognition using CNN
4.	Dimensionality reduction using CNN
5.	Image classification using transfer learning models.

6.	Sentiment Analysis of restaurant reviews using LSTM
7.	Time series prediction using RNN
8.	Image generation for plant disease dataset using GAN
9.	Fine-tuning of transfer learning models for image classification and segmentation.
10.	Image Compression using Autoencoder
11.	Object detection using YOLO
12.	Segmentation using Transfer learning model

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – VI (2023 course)

COURSE: CLOUD COMPUTING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: - 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work: 25 Marks Oral : 25 Marks	Credits: 4

Course Pre-requisites: The student should have a basic knowledge of cloud services.

Course Objective: The student should acquire the knowledge of

1.	To introduce the origins, characteristics, and service models (IaaS, PaaS, SaaS) of cloud computing, highlighting its platforms, features, and benefits.
2.	To explore the concepts and benefits of virtualization, and analyze cloud architecture, deployment models, and associated challenges in adopting cloud solutions.
3.	To understand cloud security mechanisms and equip students with the skills to design and implement cloud simulations using VMWare.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand the origins, characteristics, models (IaaS, PaaS, SaaS), platforms, features, and benefits of cloud computing.
2.	Evaluate on virtualization concepts, types, benefits, and its role in cloud computing.
3.	Evaluate cloud architecture and deployment models.
4.	Analyse cloud security with threat detection with multiple simulators.
5.	Implement cloud simulators with VMWare Simulator
6.	Understand cloud virtualization and containerization with respect to cloud trends.

Course Content:		
Unit-I	**CLOUD COMPUTING OVERVIEW** Cloud Computing Overview Origins of Cloud computing, Cloud platforms, Essential characteristics, Cloud Platforms, IAAS, PAAS, SAAS, Roots of cloud computing, Features, Benefits, applications.	**(6 Hrs)**
Unit-II	**CLOUD VIRTUALIZATIONS** Virtualization and cloud computing, Need of virtualization, administration, fast deployment, reduce infrastructure cost, limitations, Types of hardware virtualization: Full virtualization, partial virtualization, para virtualization Desktop virtualization: Software virtualization, Memory virtualization, Storage virtualization, Data virtualization, Network virtualization	**(6 Hrs)**
Unit-III	**CLOUD ARCHITECTURE LAYERS AND MODELS** Cloud Architecture- Layers and Models Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption. Cloud deployment model: Public clouds, Private clouds, Community clouds, Hybrid clouds, Advantages of Cloud computing.	**(6 Hrs)**
Unit-IV	**CLOUD SECURITY AND SIMULATORS** Identity and Access Management (IAM), data encryption, network security, cloud configuration management, threat detection and response, compliance regulations, data loss prevention (DLP), virtual machine security, container security, security incident and event management (SIEM), cloud provider specific security features, and best practices for different cloud platforms like AWS, Azure	**(6 Hrs)**
Unit-V	**CLOUD AND VMWARE SIMULATOR** Cloud Simulators: CloudSim and GreenCloud Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture (User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud. Introduction to VMWare Simulator Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines-	**(6 Hrs)**

	understanding virtual machines, create a new virtual machine on local host.	
Unit-VI	**TRENDS IN CLOUD COMPUTING** Edge computing: Cloud Computing with edge computing, features, advantages and disadvantages. Cloud Computing with fog computing: Virtualization and containerization for edge computing: Introduction to Virtualization and containerization, Advantages of Virtualization and Containerization.	**(6 Hrs)**

Textbook:	
1.	"Cloud Computing: Principles and Paradigms" by Rajkumar Buyya, James Broberg, and Andrzej M. Goscinsk
2.	"Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl, Zaigham Mahmood, and Ricardo Puttini.
3.	Bernard Golden, "Amazon Web Services for Dummies", John Wiley & Sons, Inc.

Reference Books:	
1.	"Cloud Computing: Theory and Practice" by Dan C. Marinescu

List Of Experiments	
1.	To understand the origin of cloud computing, cloud cube model, NIST model, characteristics of cloud, different deployment models, service models, advantages and disadvantages.
2.	To study and implement Hosted Virtualization using VirtualBox& KVM. [To know the concept of Virtualization along with their types, structures and mechanisms. This experiment should have demonstration of creating and running Virtual machines inside hosted hypervisors like VirtualBox and KVM with their comparison based on various virtualization parameters].
3.	To study and Implement Bare-metal Virtualization using Xen, HyperV or VMware Esxi. [To understand the functionality of Bare-metal hypervisors and their relevance in cloud computing platforms. This experiment should have demonstration of install, configure and manage Bare Metal hypervisor along with instructions to create and run virtual machines inside it. It should also emphasize on accessing VMs in different environments along with additional services provided by them like Load balancing, Auto-Scaling, Security etc]

4.	To Implement Infrastructure as a Service using AWS/Microsoft Azure. [To demonstrate the steps to create and run virtual machines inside public cloud platform. This experiment should emphasize on creating and running Linux/Windows Virtual machine inside Amazon EC2 or Microsoft Azure Compute and accessing them using RDP or VNC tools].
5.	To Implement Platform as a Service using AWS Elastic Beanstalk/ Microsoft Azure App Service. [To demonstrate the steps to deploy Web applications or Web services written in different languages on AWS Elastic Beanstalk/ Microsoft Azure App Service]
6.	To study and Implement Storage as a Service using Own Cloud/ AWS S3, Glaciers/ Azure Storage. [To understand the concept of Cloud storage and to demonstrate the different types of storages like object storage, block level storages etc. supported by Cloud Platforms like Own Cloud/ AWS S3, Glaciers/ Azure Storage]
7.	To Implement Security as a Service on AWS/Azure [To understand the Security practices available in public cloud platforms and to demonstrate various Threat detection, Data protection and Infrastructure protection services in AWS and Azure.]
8.	To implement Identity and Access Management (IAM) practices on AWS/Azure cloud. [To understand the working of Identity and Access Management IAM in cloud computing and to demonstrate the case study based on Identity and Access Management (IAM) on AWS/Azure cloud platform]
9.	To Implement Containerization using Docker. [To know the basic differences between Virtual machine and Container. It involves demonstration of creating, finding, building, installing, and running Linux/Windows application
Project Base Learning (Topics)	
1.	Deploying a Web Application on the Cloud
2.	Build and deploy a scalable web application using platforms like AWS Elastic Beanstalk, Azure App Service, or Google App Engine.
3.	Implementing Cloud Storage Solutions
4.	Design and implement a data storage and retrieval system using cloud storage services such as Amazon S3, Azure Blob Storage, or Google Cloud Storage.
5.	Building a Serverless Application
6.	Develop a serverless application using AWS Lambda, Azure Functions, or Google Cloud Functions to handle backend logic without managing servers.
7.	Creating a Multi-Tier Architecture

8.	Design and implement a multi-tier architecture (web, application, and database layers) using cloud services like AWS EC2, RDS, and Load Balancer.
9.	Cloud-Based Machine Learning Model Deployment
10.	Train a machine learning model locally and deploy it on cloud services like AWS SageMaker, Azure Machine Learning, or Google AI Platform.
11.	Disaster Recovery and Backup Solutions
12.	Implement a cloud-based disaster recovery and backup system using AWS Backup, Azure Backup, or Google Cloud Backup and DR.

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – VI (2023 course)

COURSE: BIG DATA ANALYSIS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: - 03 Hours/ Week Practical :- 02 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work: 25 Marks Practical : 25 Marks	Credits: 4

Course Pre-requisites: The students should have knowledge probability and statistics and programming skills such as python, knowledge of SQL.

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

1.	Understand the building blocks of Big Data Analytics
2.	Apply fundamental enabling techniques like Hadoop and MapReduce in solving real world problems.
3.	Understand different NoSQL systems and how it handles big data.
4.	Apply advanced techniques for emerging applications like stream analytics.
5.	Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications, etc.
6.	Apply statistical computing techniques and graphics for analyzing big data.

Course Content:

Unit-I	**INTRODUCTION TO BIG DATA AND HADOOP** Introduction to Big Data - Big Data characteristics and Types of Big Data, Traditional vs. Big Data business approach, Case Study of Big Data Solutions,Concept of Hadoop, Core Hadoop Components, Hadoop Ecosystem.	**(6 Hrs)**
Unit-II	**HADOOP HDFS AND MAPREDUCE** Distributed File Systems: Physical Organization of Compute Nodes, LargeScale File-System Organization, MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures Algorithms Using MapReduce: Matrix-Vector Multiplication by MapReduce,	**(6 Hrs)**

	Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union ,Intersection, and Difference by MapReduce, Hadoop Limitation.	
Unit-III	**INTRODUCTION TO NOSQL** Introduction to NoSQL, NoSQL Business Drivers NoSQL Data Architecture Patterns: Key-value stores, Graph stores, Column family (Bigtable)stores, Document stores, Variations of NoSQL architectural patterns, NoSQL Case StudyNoSQL solution for big data, Understanding the types of big data problems; Analyzing big data with a shared-nothing architecture; Choosing distribution models: master-slave versus peer-to-peer; NoSQL systems to handle big data problems.	**(6 Hrs)**
Unit-IV	**MINING DATA STREAMS** The Stream Data Model: A Data-Stream-Management System, Examples of Stream Sources, Stream Queries, Issues in Stream Processing.Sampling Data techniques in a Stream	**(6 Hrs)**
Unit-V	**REAL-TIME BIG DATA MODELS** A Model for Recommendation Systems, Content-Based Recommendations,Collaborative Filtering, Case Study: Product Recommendation, Social Networks as Graphs, Clustering of Social-Network Graphs, Direct Discovery of Communities in a social graph.	**(6 Hrs)**
Unit-VI	**DATA ANALYTICS WITH R** Exploring Basic features of R, Exploring RGUI, Exploring RStudio, Handling Basic Expressions in R, Variables in R, Working with Vectors, Storing and Calculating Values in R, Creating and using Objects, Interacting with users, Handling data in R workspace, Executing Scripts, Creating Plots,Accessing help and documentation in R Reading datasets and Exporting data from R, Manipulating and Processing Data in R, Using functions instead of script, built-in functions in R, Data Visualization: Types and Applications	**(6 Hrs)**
Textbook:		
1.	Cre Anand Rajaraman and Jeff Ullman ―Mining of Massive Datasets‖, Cambridge University Press	

2.	Alex Holmes ―Hadoop in Practice‖, Manning Press, Dreamtech Press
3.	Dan Mcary and Ann Kelly ―Making Sense of NoSQL‖ – A guide for managers and the rest of us, Manning Press.
4.	EMC Education Services,‖Data Science and Big Data Analytics‖,Wiley
5.	DT Editorial Services, ―Big Data Black Book‖, Dreamtech Press

Reference Books:

1.	Bill Franks, ―Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, Wiley and SAS Business Series, 2012.
2.	David Loshin, "Big Data Analytics: From Strategic Planning to EnterpriseIntegration with Tools, Techniques, NoSQL, and Graph", 2013.
3.	Jared Dean, ―Big Data, Data Mining, and Machine Learning: Value Creation for Business Leaders and Practitioners‖,Wiley India Private Limited, 2014

List of Experiments:

1.	Understanding Hadoop Ecosystem: Install and configure Hadoop on a single-node cluster.Explore Hadoop core components (HDFS, YARN, and MapReduce).
2.	Working with Hadoop Ecosystem: Perform basic Hadoop commands for file handling in HDFS.Upload, download, and delete files in HDFS using CLI..
3.	Implementing Word Count using MapReduce. Write and execute a simple MapReduce program for word count. Observe the Map and Reduce phases using logs.
4.	Setting up NoSQL Database (MongoDB/Cassandra): Install and configure MongoDB or Cassandra. Perform basic CRUD (Create, Read, Update, Delete) operations.
5.	Create and query data using key-value, document, and column-family models.
6.	Implement a content-based recommendation system using Python and Pandas.

7.	Analyzing Social Network Graphs using NetworkX
8.	Load and manipulate datasets in R. Perform basic statistical operations and visualization.
9.	Create different types of plots (bar chart, scatter plot, histogram) using ggplot2 in R.
10.	Implement predictive Analytics techniques (regression/time series, etc.) using R/Scilab/Tableau/ Rapid miner

Project Base Learning (Topics)	
1.	Market Basket Analysis (MBA)
2.	Airline Dataset Analysis
3.	Data Clustering & Customer Segmentation
4.	Movie Rating Prediction
5.	Credit Card Fraud Detection
6.	Stock Market Trend Analysis
7.	Sentiment Analysis on Social Media Data
8.	Medical Data Analysis & Disease Prediction
9.	E-commerce Product Recommendation System
10.	Fake News Detection

Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – VI (2023 course)

COURSE: SOFT COMPUTING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory:- 03 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 3

Course Pre-requisites: The students should have knowledge of Programming language , Linear Algebra etc.

Course Objective: On completion of the course

1.	To study the various soft computing approaches.
2.	To understand the soft computing techniques and algorithms for problem solving
3.	To be familiar with the various application areas of soft computing.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand requirement of soft computing and various soft computing techniques.
2.	Understand Artificial Neural Network and its characteristics and implement ANN algorithms.
3.	Understand the Fuzzy logic and implement fuzzy algorithms for solving real life problems.
4.	Apply knowledge of Genetic algorithms for problem solving.
5.	Implement Evolutionary Computing Techniques.
6.	Develop hybrid systems for real world problem solving.

Course Content:

Unit-I	**INTRODUCTION TO SOFT COMPUTING** Introduction to Soft Computing and Computational Intelligence, Characteristics of Soft computing, Comparison Soft Computing Vs Hard Computing, Requirements of Soft Computing, Soft Computing Techniques – Artificial Neural Network, Fuzzy Logic., Evolutionary computing and Hybrid systems, Applications of Soft Computing. learning paradigms: supervised, unsupervised, reinforcement learning.	**(4 Hrs)**

Unit-II	**ARTIFICIAL NEURAL NETWORK** Artificial neural Network, Biological neuron, Mc Culloch-Pits Neuron Model, Topologies of neural networks, Activation functions, implementation of logical AND, OR, XOR, Neural Networks: Associative Memory Networks and their Applications. Supervised Learning, Radial Basis Function Networks, Back Propagation Neural Network, Unsupervised Learning: Competitive Learning networks; Self-Organizing Networks; Hebbian learning.	**(8 Hrs)**
Unit-III	**FUZZY LOGIC** Concept of Fuzzy number, fuzzy set theory-continuous, discrete, Operations on fuzzy sets, Fuzzy Composition, Fuzzy member-ship functions , primary and composite linguistic terms, Concept of fuzzy relation and inference, Fuzzification, de-fuzzification methods, Mamdani inference rule, Sugeno inference rule, design of fuzzy controller System.	**(6 Hrs)**
Unit-IV	**GENETIC ALGORITHM** Introduction to Basic Terminologies in Genetic Algorithm: Individuals, Genes, Fitness, Populations; Simple GA; General Genetic Algorithm; Operators in Genetic Algorithm: Encoding, Selection, Crossover (Recombination), Mutation; Stopping Condition for GA Flow; Constraints in Genetic Algorithms; Problem Solving Using Genetic Algorithm; Advantages and Limitations of Genetic Algorithms; Applications of Genetic Algorithms.	**(6 Hrs)**
Unit-V	**EVOLUTIONARY COMPUTING** Evolutionary Computing, Evolution Strategies, Evolutionary Programming, Hill Climbing and Simulated Annealing (SA), Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO), Whale Optimization Algorithm (WOA), Humming Bird Optimization algorithm.	**(6 Hrs)**
Unit-VI	**HYBRID SYSTEM AND APPLICATION AREAS OF SOFT COMPUTING** Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems, GA based Backpropagation Networks, Fuzzy Backpropagation Networks.	**(6 Hrs)**
Textbook:		

1.	S.N. Sivanandam, ―Principles of Soft Computing‖, Wiley India-
2.	Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani,―Neuro-Fuzzy and Soft Computing A Computational Approach to Learning and Machine Intelligence‖, Prentice Hall.
3.	S.Rajasekaran, and G. A. Vijayalakshmi Pai, ―Neural Networks, Fuzzy Logic and Genetic Algorithms : Synthesis, and Applications‖, Prentice Hall of India.

Reference Books:	
1.	Nikola K. Kasabov, ―Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering‖, MIT Press.
2.	Seyedali Mirjalili, ―Evolutionary Algorithms and Neural Networks Theory and Applications, Studies in Computational Intelligence‖, Vol 780, Springer, 2019, McGraw Hill.
3.	Timothy J. Ross, ―Fuzzy Logic with Engineering Applications‖, Wiley India.
4.	L. N. de Castro, ―Fundamentals of Natural Computing: Basic Concepts, Algorithms, and Applications‖, 2006, CRC Press,

Project Base Learning (Topics)	
1.	Design a fuzzy logic-based parking system to manage space allocation and suggest optimal parking spots.
2.	Build a fuzzy logic system to optimize water usage based on soil moisture, temperature, and humidity.
3.	Develop a fuzzy logic system for diagnosing diseases like diabetes or hypertension based on symptoms and patient data.
4.	Train a neural network to classify text as positive, negative, or neutral using datasets like IMDb or Twitter Sentiment Analysis.
5.	Create a chatbot using neural networks like RNNs or transformers (e.g., GPT models).
6.	Create a model to forecast traffic congestion based on historical traffic data.
7.	Optimize strategies for games like chess, tic-tac-toe, or Flappy Bird using GAs.
8.	Use GAs to optimize the movement paths of robots in a defined environment.

9.	Use GAs to select the best subset of features for a classifier or regression model.

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. (Common for All) Sem –VI (2023 course)

COURSE: PROFESSIONAL SKILLS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical :- 2 Hours/ Week	Term Work : 50 Marks	Credits:1

Course Pre-requisites: The students should have knowledge of

1.	Basic mathematical concepts, reasoning skills, and comprehension abilities.
2.	Fundamentals of communication processes and soft skills.
3.	Basic understanding of leadership qualities, ethics, etiquettes, and values.

Course Objective: This course is structured to provide students with a well-rounded foundation in quantitative aptitude, logical and verbal reasoning, professional communication, employment skills, leadership development, and business ethics. By integrating these components, students will be better equipped to excel in recruitment processes and succeed in their professional careers.

Course Outcomes: The student will be able to

1.	Apply shortcut techniques to solve quantitative aptitude questions efficiently in recruitment and competitive exams.
2.	Utilize logical reasoning methods and mnemonics to enhance problem-solving skills in placement tests.
3.	Improve verbal communication skills, including vocabulary, sentence patterns, and reading comprehension, for effective professional interactions.
4.	Develop proficiency in job application writing, resume building, and interview skills to enhance employability..
5.	Understand and apply soft skills, leadership qualities, and professional ethics in the workplace.
6.	Demonstrate appropriate corporate etiquette, business ethics, and values in professional settings.

Course Content:

Unit-I	QUANTITATIVE APTITUDE :	(4 Hrs)

	• Number System, Percentage, Profit and Loss, Simple & Compound Interest • Ratio, Proportion, and Average • Mixture and Allegation • Time, Speed & Distance, Time & Work • Permutation & Combination, Probability • Pipes and Cisterns	
Unit-II	**LOGICAL REASONING :** • Coding-Decoding, Number Series, Blood Relation, Directions • Cubes & Dices, Data Interpretation, Data Sufficiency • Set Theory & Syllogisms, Matching, Selection & Arrangement • Clocks & Calendars, Visual Reasoning • Input-Output & Flow Charts	**(4 Hrs)**
Unit-III	**VERBAL REASONING:** • Sentence Patterns, Sentence Correction, Spotting Errors • Vocabulary, Antonyms & Synonyms, Analogy • Phrasal Verbs, Idiomatic Expressions • Reading Comprehension, Cloze Test • Sentence Rearrangement and Theme Detection	**(4 Hrs)**
Unit-IV	**HONING EMPLOYBILITY AND PRESENTATION SKILLS:** • Job Application Letters: Layout, Structure, Covering Letter • Resume & CV Building: Structure, Effective Writing Tips • Group Discussion: Skills, Strategies, and Evaluation • Interview Skills: Telephonic & Face-to-Face Interviews • Body Language, Grooming & Etiquette for GD & PI • Extempore Speaking Techniques • Presentation Skills: Structure, Layout, Flow, and PPT Creation	**(4 Hrs)**
Unit-V	**SOFT SKILLS AND LEADERSHIP DEVELOPMENT:** • Soft Skills: Definition, Importance, and Differences from Hard Skills • Life Skills & Personal Development • Team Building & Conflict Resolution • Problem-Solving, Time & Stress Management	**(4 Hrs)**

	• Pareto Principle (80/20 Rule), Time Management Matrix • Leadership Skills: Importance, Types, Attributes of a Good Leader • Motivational Theories and Emotional Intelligence in Professional Life.	
Unit-VI	**BUSINESS ETHICS ,ETIQUETTES AND VALUES:** • Ethics & Values in the Business World • Respect for Individuality and Workplace Diversity • Key Features of Corporate Etiquette • Corporate Grooming & Dressing • Social & Office Etiquette • Importance of Professional Behavior in the Workplace • Corporate Social Responsibility (CSR): Need and Importance.	**(4 Hrs)**

Reference Books:		
1.	Quantitative Aptitude by R. S. Agarwal published by S. Chand	
2.	The Book of Numbers by Shakuntala Devi	
3.	A Modern Approach To Logical Reasoning by R. S. Agarwal published by S. Chand	
4.	A New Approach to Reasoning Verbal & Non-Verbal by Indu Sijwali	
5.	Business Communication by Meenakshi Raman, Prakash Singh published by Oxford University press, second edition	
6.	Communication Skills by Sanjay Kumar, Pushp Lata, published by Oxford University press, second edition	
7.	Technical Communication by Meenakshi Raman, Sangeeta Sharma published by Oxford University press	
8.	Developing Communication Skills by Krishna Mohan, Meera Banerji published by Macmillan India Pvt Ltd	
9.	Soft Skills by Meenkashi Raman, published by Cengage publishers	
10.	Soft Skills by Dr. K Alex published by Oxford University press	
11.	Soft skills for Managers by Dr. T. Kalyana Chakravarthi and Dr. T. Latha Chakravarthi published by biztantra	

Term Work Assignments

Unit-I: QUANTITATIVE APTITUDE
1. Solve 20 practice problems on Number System, Percentage, and Profit & Loss.
2. Create a comparative analysis of Simple Interest vs. Compound Interest with real-world examples.

Unit-II: LOGICAL REASONING
1. Solve a set of logical reasoning problems covering Coding-Decoding, Blood Relations, and Directions.
2. Prepare a case study on how logical reasoning skills are used in competitive exams and corporate assessments.

Unit-III: VERBAL REASONING
1. Identify and correct errors in 10 sentences focusing on sentence structure and grammatical mistakes.
2. Develop a vocabulary list with antonyms, synonyms, and phrasal verbs commonly used in professional settings.

Unit-IV: HONING EMPLOYABILITY AND PRESENTATION SKILLS
1. Draft a job application letter along with a structured resume tailored for a technical position.
2. Participate in a mock group discussion and receive peer and instructor feedback.
3. Conduct a mock interview (telephonic & face-to-face) and submit an evaluation report

Unit-V: SOFT SKILLS AND LEADERSHIP DEVELOPMENT (Term Work Assignments)
1. Conduct a self-assessment on personal soft skills and identify areas for improvement.
2. Develop a time management plan using the Pareto Principle (80/20 Rule) and Time Management Matrix.
3. Prepare a report on different leadership styles and their impact in the corporate world.

Unit-VI: BUSINESS ETHICS, ETIQUETTES, AND VALUES
1. Write a report on corporate ethics and how companies implement ethical policies.
2. Conduct a role-play activity demonstrating appropriate corporate etiquette in business interactions.
3. Prepare a presentation on the significance of Corporate Social Responsibility (CSR).

Programme: B. Tech. Sem – VI (2023 course)

COURSE: SKILL BASED COURSE–VI (DEVOPS LAB)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Practical :- 02 Hours/ Week	Term Work : 25 Marks Practical : 25 Marks	Credits: 1

Course Pre-requisites: Operating System, Virtualization, Cloud Computing, Java and Web Programming, and Software Engineering.

Course Objective: On completion of the course

1.	The student will be familiar with the concepts of Docker and can apply it in real world problem.
2.	The student will be able to perform software configuration management and build applications using Jenkins.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand the importance of DevOps tools used in software development life cycle.
2.	Examine the different Version Control strategies.
3.	Analyze & Illustrate the Containerization of OS images and deployment of applications over Docker.
4.	Illustrate & Configure the final image into the Docker file for the Containerization.
5.	Configure a web server using Software Configuration Management.
6.	Build, Deploy and Test Software Applications using Jenkins.

Course Content:

Unit-I	**INTRODUCTION TO DEVOPS** Introduction to DevOps, Evolution of DevOps, DevOps Essentials - Introduction to AWS, DevOps Tools used in software development life cycle, Agile principles and their relation to DevOps, working of DevOps, DevOps Pipeline and Methodology.	**(4 Hrs)**

Unit-II	**VERSION** **CONTROL** Introduction to Version control systems: Version Control on websites/ Softwares using different Version control tools like RCS/ CVS/Mercurial/ Github, and Git basics (repositories, commits, branches, merging), Git workflows (feature branching, pull requests), Introduction to SVN repository and basic operations (checkout, commit, update).	**(4 Hrs)**
Unit-III	**VIRTUALIZATION & CONTAINERIZATION** Docker-desktop Install and Configure for creating Containers of different Operating System Images. Container life cycle, Docker Image, Docker container, share and copy container. Build, deploy and manage web or Java application on Docker.	**(4 Hrs)**
Unit-IV	**ADVANCED VIRTUALIZATION & CONTAINERIZATION** Creation and uses of a Dockerfile to containerize a custom application. Using commands to execute tasks like setting environment variables, exposing ports, and copying files. Linking and naming containers. Docker networking for connect containers.	**(4 Hrs)**
Unit-V	**SOFTWARE CONFIGURATION MANAGEMENT** Software Configuration Management Installation and configuration using Chef/Puppet/Ansible or Saltstack. Create a playbook to install and configure a web server.	**(4 Hrs)**
Unit-VI	**CONTINUOUS INTEGRATION AND DEVELOPMENT** Install Jenkins and set up a basic CI pipeline for a sample project to test and deploy. Set different roles and assign permissions to secure Jenkins.	**(4 Hrs)**

Textbook:	
1.	Karl Matthias & Sean P. Kane, Docker: Up and Running, O'Reilly
2.	Publication.
3.	Len Bass,Ingo Weber,Liming Zhu,"DevOps, A Software Architects Perspective", Addison- Wesley-Pearson Publication.
4.	Learn to Master DevOps by Star EduSolutions.

Reference Books:	
1.	Sanjeev Sharma and Bernie Coyne,"DevOps for Dummies", Wiley Publication
2.	Httermann, Michael, "DevOps for Developers",Apress Publication.
3.	Joakim Verona, "Practical DevOps",Pack publication

	List Of Experiments
1.	Explore tools commonly used in DevOps pipelines.
2.	Initialize a Git repository and perform basic operations (clone, commit, push, pull).
3.	Implement Git workflows (e.g., GitFlow, feature branch workflow).
4.	Set up an SVN repository and perform basic operations (checkout, commit, update).
5.	Create and use a Dockerfile to containerize a custom application.
6.	Implement Docker networking to connect containers.
7.	Install Jenkins and set up a basic CI pipeline for a sample project.
8.	Create different roles and assign permissions to secure Jenkins.
9.	Write a playbook to install and configure a web server.
10.	Containerize the application using Docker and deploy it using Ansible.

Programme: B. Tech. Sem – VI (2023 course)

COURSE: CRYPTOGRAPHY AND NETWORK SECURITY (PEC-II)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory:- 03 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 3

Course Pre-requisites: The students should have basic knowledge of Computer Networks and applied Mathematics.

Course Objective: On completion of the course

1.	Students will understand need for cryptography
2.	Students will be able to apply different techniques for Encryption and decryption.
3.	Student will be familiar with basic principles of network security.

Course Outcomes: At the completion of the course, the students should be able to

1.	Understand the basics of computer security and cryptography.
2.	Implement Symmetric key cryptography techniques.
3.	Understand mathematical models needed for cryptographic techniques.
4.	Implement asymmetric cryptography & key exchange algorithms.
5.	Analyse the different algorithms to implement digital signature and hashing mechanism.
6.	Analyse the security principles at various layers of OSI model.

Course Content:

Unit-I	**INTRODUCTION** Computer Security Concepts- OSI security Architecture, Security attacks, Services, mechanism, model of network security, Basic of Cryptography, Cryptanalysis, difference between cryptography and Steganography.	**(6 Hrs)**
Unit-II	**SYMMETRIC KEY CRYPTOGRAPHY** Classical encryption techniques: Substitution Cipher (Mono-alphabetic, Poly-alphabetic), Transposition cipher, Block Cipher-Encryption Principles, DES and its variants, strength of DES, AES, RC4.	**(6 Hrs)**

Unit-III	**MATHEMATICS OF CRYPTOGRAPHY** Euclidian algorithm, Extended Euclidian Algorithm, Euler's Totient Function, Ferment little Theorem, Eulers theorem, Primality Testing-Miller Rabin test, Chinese Remainder Theorem, Exponential- square and multiply method, Discrete Logarithm	**(6 Hrs)**
Unit-IV	**ASYMMETRIC CRYPTOGRAPHY & KEY EXCHANGE** Public Key cryptography-RSA, Cryptanalysis of RSA, Elgamal cryptography, Key Management and distribution: KDC, Diffie Hellman Key Exchange	**(6 Hrs)**
Unit-V	**DIGITAL SIGNATURES** User Authentication protocol- Kerberos, Digital Signature –RSA, Elgamal, DSS, Data integrity Algorithms-Hash Functions, MD5, SHA-512.	**(6 Hrs)**
Unit-VI	**SECURITY** Security at Application layer-Email Architecture, S/MIME, PGP-Scenarios, key rings, Security at Transport layer-SSL (Services, Protocols), Security at Network layer-IPSec (Modes, Security Protocols-AH, ESP, Services provided by IPSEC)	**(6 Hrs)**

Textbook:		
1.	Behrouz A. Forouzan, "Cryptography and Network Security"- McGraw Hill	

Reference Books:		
1.	Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.	
2.	Stallings, W., "Cryptography and Network Security – Principles and Practices", Prentice Hall of India, Fourth Edition.	

Project Base Learning (Topics)	
1.	Analysis and Assessment of different Cyber-Attacks
2.	New Network visualization Strategies for Attack Detection
3.	Security Improvement in Internet Services and Applications
4.	Network Monitoring and Anomalies Discovery
5.	Enhanced Security Solutions for Resource-Constrained IoT devices
6.	Assessment of Diverse Intrusion Detection Methods
7.	Investigation of Network Protocols and Behavior
8.	Risk Evaluation in Cyber-Physical Systems
9.	Analysis of Cyber Threats and Attacks in Data Traffic

10.	Examination of Security Attack Impact on User Privacy	

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – VI (2023 course)

COURSE: BUSINESS INTELLIGENCE(PEC-II)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 3

Course Pre-requisites: Students Should have Knowledge of	
1.	Mathematics, analytical, and writing documentation skills.
Course Objective:	
1	The objective of the above course is to introduce the concepts and components of Business Intelligence (BI) and to evaluate the technologies that make up BI (data warehousing, OLAP).
2	To identify the technological architecture that makes up BI systems plan the implementation of a BI system.
Course Outcomes: After the completion of the course, the students should be able to	
1	Explain basics of business intelligence, Analytics and Decision Support Systems
2	Understand the phases of Decision-making process and components of Decision support system
3	Apply decision making models with decision tables and trees
4	Understand the basics of Automated system and Expert systems
5	Design OLAP applications for Data extraction.
6	Apply the process of ETL for data extraction using the required tools.

Course Content:		
Unit-I	**AN OVERVIEW OF BUSINESS INTELLIGENCE, ANALYTICS, AND DECISION SUPPORT:** Information Systems Support for Decision Making, An Early Framework for Computerized Decision Support, The Concept of Decision Support Systems, A Framework for Business Intelligence, BI Process and BI Roles and Responsibilities	**(6 Hrs)**

Unit-II	**DECISION MAKING:** Introduction and Definitions, Phases of the Decision, Making Process, The Intelligence Phase, Design Phase, Choice Phase, Implementation Phase, Decision Support Systems Capabilities,Decision Support Systems Classification, Decision Support Systems Components.	**(6 Hrs)**
Unit-III	**DECISION MAKING MODELS:** Decision Support Systems modelling, Structure of mathematical models for decision support, Certainty, Uncertainty, and Risk, Decision modelling with spreadsheets, Mathematical programming optimization, Decision Analysis with Decision Tables and Decision Trees	**(6 Hrs)**
Unit-IV	**AUTOMATED DECISION SYSTEMS AND INTRODUCTION TO EXPERT SYSTEMS** Automated Decision Systems, The Artificial Intelligence field, Basic concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems.	**(6 Hrs)**
Unit-V	**ON-LINE ANALYTICAL PROCESSING (OLAP)** Introduction to OLAP, OLAP and OLTP, Operational Data Stores, Variations in Data and Approach, OLAP Applications and Functionality, Multi-Dimensions, Thinking in More Than Two Dimensions, Drilling and Pivoting , OLAP Architecture, Cubism Tools, ROLAP, MOLAP, HOLAP	**(6 Hrs)**
Unit-VI	**BASICS OF DATA INTEGRATION (EXTRACTION TRANSFORMATION LOADING)** Concepts of data integration, need and advantages, common data integration approaches, Basic components in ETL,ETL Process ,Introduction to data quality, data profiling concepts and, Applications, ETL tools basics: Informatica, AWS Glue	**(6 Hrs)**

Textbook:	
1.	Ramesh Sharda, Dursun Delen, EfraimTurban, J.E.Aronson,Ting-Peng Liang, David King, "Business Intelligence and Analytics: System for Decision Support", 10th Edition, Pearson Global Edition, 2013
2.	David Loshin, Business Intelligence: The Savvy Manager's Guide , Knowledge Enterprise, 2011
3.	Cindi Howson, Successful Business Intelligence, Tata McGraw Hill, 2014

Reference Books:	
1	Data Analytics: The Ultimate Beginner's Guide to Data Analytics Paperback – 12 November 2017by Edward Mize.
2	Mike Biere , Business Intelligence for Enterprices ,Addison Wesley Publication, 2010
Unit Test :	
Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

Programme: B. Tech. Sem – VI (2023 course)

COURSE: SOFTWARE TESTING(PEC-II)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory :- 03 Hours/ Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 3

Course Pre-requisites: Software Engineering

Course Objective: On completion of the course

1.	Basic software debugging methods.
2.	White box and black box testing methods and techniques.
3.	Designing test plans and learn Different testing tools

Course Outcomes: At the completion of the course, the students should be able to

1.	Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
2.	Design test cases using white box and black box testing techniques.
3.	Design test suite using test case prioritization techniques.
4.	Understand the different automation testing tools and its importance.
5.	Apply the software testing techniques in specialized environment.
6.	Distinguish between different quality standards for quality assurance.

Course Content:

Unit-I	**TESTING METHODOLOGY**	**(6 Hrs)**
	Introduction, Goals of Software Testing, Software Testing Definitions, Model for Software Testing, Effective Software Testing vs Exhaustive Software Testing, Software Failure Case Studies, Software Testing Terminology, Software Testing Life Cycle (STLC), Software Testing methodology, Verification and Validation, Verification requirements, Verification of high level design, Verification of low level design,Validation	

Unit-II	**TESTING TECHNIQUES** Dynamic Testing: Black Box testing: boundary value analysis, equivalence class testing, state table based testing, cause-effect graphing based testing, error guessing. White box Testing Techniques: need, logic coverage criteria, basis path testing, graph matrices, loop testing, data flow testing, mutation testing. Validation Activities: Unit validation, Integration, Function, System, Acceptance Testing.Regression Testing: Progressive vs. Regressive, regression testing produces quality software, regression testability, objectives of regression testing, regression testing types, define problem, regression testing techniques.	**(6 Hrs)**
Unit-III	**MANAGING THE TEST PROCESS** Test Management: test organization, structure and of testing group, test planning, detailed test design and test specification.Software Metrics: need, definition and classification of software matrices, Efficient Test Suite Management: minimizing the test suite and its benefits, test suite minimization problem, test suite prioritization its type , techniques and measuring effectiveness.	**(6 Hrs)**
Unit-IV	**TEST AUTOMATION** Automation and Testing Tools: need, categorization, selection and cost in testing tool, guidelines for testing tools. Study of testing tools: JIRA, Bugzilla, Test Director and IBM Rational ,Functional Tester, Selenium etc.	**(6 Hrs)**
Unit-V	**TESTING FOR SPECIALIZED ENVIRONMENT** Agile Testing, Agile Testing Life Cycle, Testing in Scrum phases, Challenges in Agile Testing,Testing Web based Systems: Web based system, web technology evaluation, traditional software and web based software, challenges in testing for web based software, testing web based testing.	**(6 Hrs)**
Unit-VI	**QUALITY MANAGEMENT** Software Quality Management, McCall's quality factors and Criteria, ISO 9126 quality characteristics, ISO9000:2000, Software quality management.	**(6 Hrs)**
Textbook:		
1.	Software Testing Principles and Practices Naresh Chauhan Oxford Higher Education	

2.	Software Testing and quality assurance theory and practice by Kshirasagar Naik, Priyadarshi

Reference Books:

1.	Effective Methods for Software Testing , third edition by Willam E. Perry, Wiley Publication
2.	Software Testing Concepts and Tools by Nageswara Rao Pusuluri , Dreamtech press.

Project Base Learning (Topics)

1.	Designing of Test cases for Social Networking app using Black box Testing Technique
2.	Designing of Test cases for Hotel reservation application using Black box Testing Technique
3.	Designing of Test cases for operating system using Black box Testing Technique
4.	Designing of Test cases using Mutation Testing Technique
5.	Designing of Test cases using Control flow basis path Testing Technique
6.	Designing of Test cases using Dynamic Data Flow Testing Technique
7.	Performing Agile testing and test report for any application
8.	Performing web based testing and test report for any application
9.	Designing Stub and Drivers for unit validation testing.
10.	Performing Integration Testing for any application and design test cases for it.
11.	Design test cases for functional and non-functional System level testing

Unit Test :

Unit Test – I	Unit I, II, III
Unit Test – II	Unit IV, V, VI

B.Tech (All Programmes) – 2023 Course
Rules and Regulations

(I) Theory

(A) Theory Examination

Theory examination consists of: (i) End semester examination (ESE), and (ii) Internal assessment (IA).

(i) ESE is of 60 marks for theory courses.

(ii) IA is of 40 marks. Out of 40 marks, 20 marks will be for Unit Tests and 20 marks will be for Project Based Learning for a given course. Two Unit Tests, each of 20 marks, will be conducted. Average of marks obtained in these two unit tests will be considered as UT marks. Roll numbers allotted to the students shall be the examination numbers for the conduction of unit tests.

(B) Standard of Passing

(i) There is a separate passing of 40% of 60 marks, i.e. 24 marks, for ESE for a given course.

(ii) There is a separate passing of 40% of 40 marks, i.e. 16, for IA for a given course.

(iii) A student who fails at ESE in a given course has to reappear only at ESE as a backlog student and clear the head of passing. Similarly, a student who fails at IA in a given course has to reappear only at IA as a backlog student and clear the head of passing

(II) Practical

(A) Practical Examination

Practical examination consists of: (i) Term work, and (ii) Practical/Oral examination for a given course based on term work.

(i) Term work (TW): TW marks are as mentioned in the curriculum structure.

(ii) Practical/Oral (PR/OR): PR/OR marks are as mentioned in the curriculum structure.

(B) Conduction of practical/oral examination

(i) A student will be permitted to appear for practical/oral examination only if he/she submits term work of a given course.

(ii) Practical/oral examination shall be conducted in the presence of internal and external examiners appointed by university.

(B) Standard of Passing

(i) A student shall pass both heads TW and PR/OR separately with minimum 40% of total marks of respective head.

(III) MOOC and Social Activity Course

(i) If a student completes one MOOC during a programme, he/ she will earn additional TWO credits, subjected to submission of the certificate of completion of the respective course. It is mandatory for a student to complete atleast two MOOC to obtain degree in a given discipline. Students shall register to MOOCs which are offered by any one the following agencies:

(a) SWAYAM   : www.swayam.gov.in

(b) NPTEL   : www.onlinecourse.nptel.ac.in

(c) Course Era   : www.coursera.org

(d) edX online learning   : www.edx.org

(e) MIT Open Course ware   : www.ocw.mit.edu

(f) Udemy   : www.udemy.com

(g) Spoken tutorial   : www.spoken-tutorial.org

(ii) If a student completes social activity, he/she will earn additional TWO credits, subjected to submission of the certificate of completion of the respective course/ activity from the relevant authorities. It is mandatory for a student to complete atleast one social activities to obtain degree in a given discipline.

(iv) The additional credits for MOOC and Social Activity will be given only after verification of the authentic document by the Head of the Department and a separate mark-sheet will be submitted by the Head of the Department along with the course examiner

(IV) A. T. K. T

(i) A student who is granted term for B. Tech. Semester-I, III, V, VII will be allowed to keep term for his/her B. Tech. Semester-II, IV, VI, VIII examination, respectively even if he/she appears and fails or does not appear at B. Tech. Semester-I,III, V, VII examination respectively.

(ii) A student shall be allowed to keep term for the B. Tech. Semester-III course if he/she has a backlog of any number of Heads of passing at B. Tech. Semester-I & II taken together.

(iii) A student shall be allowed to keep term for the B. Tech. Semester-V of respective course if he/she has no backlog of B. Tech. Semester-I & II and he/she has a backlog of any number of Heads of passing at B. Tech. Semester-III & IV taken together.

(iv) A student shall be allowed to keep term for the B. Tech. Semester- VII of respective course if he/she has no backlog of B. Tech. Semester-I, II, III, IV and he/she has a backlog of any number of Heads of passing at B. Tech. Semester-V & VI taken together.

(V) Grade Point, Grade Letter and Equivalent Marks

The student must obtain a minimum Grade Point of 5.0 (40% marks) in ESE and also in combined ESE + IA. A student who fails in ESE of a course has to reappear only to ESE as a backlog student and clear that head of passing.

Award of the Class for the Degree considering CGPA: A student who has completed the minimum credits specified for the programme shall be declared to be passed in the programme. The CGPA will be computed every year of all the courses of that year. The grade will be awarded according to the CGPA of every year.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent range of Marks (%)
$9.50 \leq$ CGPA ≤ 10.00	O	Outstanding	$80 \leq$ Marks ≤ 100
$9.00 \leq$ CGPA ≤ 9.49	A+	Excellent	$70 <$ Marks < 80
$8.00 \leq$ CGPA ≤ 8.99	A	Very Good	$60 <$ Marks < 70
$7.00 \leq$ CGPA ≤ 7.99	B+	Good	$55 <$ Marks < 60
$6.00 \leq$ CGPA ≤ 6.99	B	Average	$50 <$ Marks < 55
$5.00 \leq$ CGPA ≤ 5.99	C	Satisfactory	$40 \leq$ Marks < 50
CGPA below 5.00	F	Fail	Marks Below 40

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(VI) Minor Programme

(i) A students shall receive a MINOR degree when he/she acquire additional 20 credits in a given specialization defined by the UG programmes offered at the institute.

(ii) The theory and practical/oral components for a given course are mentioned in curriculum structure. The theory and examination for a given course are mentioned in Section I and II.

(iii) The grade point, grade letter and equivalent marks system for MINOR programme is mentioned in Section V.

(iv) The MINOR DEGREE programme is OPTIONAL. The interested students may opt MINOR programme.

(v) A student shall complete the MINOR program prior to his/her graduation.