JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU – 515002, A.P., INDIA

B. TECH R23 CURRICULUM

B.Tech – ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (AUTONOMOUS) ANANTHAPURAMU – 515002, A.P., INDIA

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B.Tech (Regular – Full Time)

(Effective for the students admitted into I Year from the Academic Year 2023–24 onwards)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

I & II YEAR COURSE STRUCTURE AND SYLLABUS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU – 515002 (A.P), INDIA

B.Tech – R23 CURRICULUM

B.Tech – Artificial Intelligence & Machine Learning

B.Tech – Artificial Intelligence & Machine Learning – R23

(Applicable from the Academic Year 2023–24 onwards)

INDUCTION PROGRAMME

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities — Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counseling	MC	0-0-6-0
3	Orientation to all branches — career options, tools, etc.	MC	2-0-2-0
4	Orientation on admitted branch — corresponding labs, tools and platforms	EC	3-0-0-0
5	Proficiency Modules & Productivity Tools	ES	2-0-3-0
6	Assessment on basic aptitude and mathematical skills	MC	2-1-2-0
7	Remedial Training in Foundation Courses	MC	2-0-3-0
8	Human Values & Professional Ethics	MC	2-1-2-0
9	Communication Skills — focus on Listening, Speaking, Reading, Writing skills	BS	3-0-0-0
10	Concepts of Programming	ES	2-1-2-0

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COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU – 515002 (A.P), INDIA
B.Tech – R23 CURRICULUM
B.Tech – (Artificial Intelligence & Machine Learning)

B.Tech – I Year I Semester

S. No.	Subject Code	Subject	L/D	T	P	Credits
1	23A15201	Engineering Physics (Common to CIVIL, MECH, CHEM, AI&ML)	3	0	0	3
2	23A15101	Linear Algebra & Calculus (Common to All Branches)	3	0	0	3
3	23A12401	Basic Electrical and Electronics Engineering (Common to CIVIL, MECH, CHEM, AI&ML)	3	0	0	3
4	23A10301	Engineering Graphics (Common to CIVIL, MECH, CHEM, AI&ML)	3	0	0	3
5	23A10501	Introduction to Programming (Common to All Branches)	3	0	0	3
6	23A10503	IT Workshop (Common to CIVIL, MECH, CHEM, AI&ML)	0	0	2	1
7	23A15202	Engineering Physics Lab (Common to CIVIL, MECH, CHEM, AI&ML)	0	0	2	1
8	23A12402	Electrical and Electronics Engineering Workshop (Common to CIVIL, MECH, CHEM, AI&ML)	0	0	3	1.5
9	23A10502	Computer Programming Lab (Common to All Branches)	0	0	3	1.5
10	23A15902	NSS/NCC/Scouts and Guides/Community Service (Common to CIVIL, MECH, CHEM, AI&ML)	–	–	1	0.5
Total			**14**	**0**	**11**	**20.5**

B.Tech – I Year II Semester

S. No.	Subject Code	Subject	L/D	T	P	Credits
1	23A25501	Communicative English (Common to CIVIL, MECH, CHEM, AI&ML)	2	0	0	2
2	23A25303	Chemistry (Common to CSE, ECE, EEE, AI&ML)	3	0	0	3
3	23A25101	Differential Equations & Vector Calculus (Common to CIVIL, MECH, CHEM, AI&ML)	3	0	0	3
4	23A21301	Basic Civil & Mechanical Engineering (Common to CIVIL, MECH, CHEM, AI&ML)	3	0	0	3
5	23A20501	Data Structures (Common to CSE, AI&ML)	3	0	0	3
6	23A25502	Communicative English Lab (Common to CIVIL, MECH, CHEM, AI&ML)	0	0	2	1
7	23A25304	Chemistry Lab (Common to CSE, ECE, EEE, AI&ML)	0	0	2	1
8	23A20301	Engineering Workshop (Common to CIVIL, MECH, CHEM, AI&ML)	0	0	3	1.5
9	23A20503	Data Structures Lab (Common to CSE, AI&ML)	0	0	3	1.5
10	23A25901	Health and Wellness, Yoga and Sports (Common to CIVIL, MECH, CHEM, AI&ML)	–	–	1	0.5
Total			**14**	**0**	**11**	**19.5**

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B.Tech – R23 CURRICULUM
B.Tech – (Artificial Intelligence & Machine Learning)

B.Tech – II Year I Semester

S. No.	Subject Code	Subject	L/D	T	P	Credits
1	23A35105	Discrete Mathematics & Graph Theory (Common to CSE, AI&ML)	3	0	0	3
2	23A39901	Universal Human Values 2 – Understanding Harmony and Ethical Human Conduct (CE, ME, CHEM, AI&ML)	2	1	0	3
3	23A33901	Artificial Intelligence	3	0	0	3
4	23A30504	Advanced Data Structures & Algorithms Analysis (Common to CSE, AI&ML)	3	0	0	3
5	23A30505	Object-Oriented Programming Through JAVA (Common to CSE, AI&ML)	3	0	0	3
6	23A30506	Advanced Data Structures & Algorithms Analysis Lab (Common to CSE, AI&ML)	0	0	3	1.5
7	23A30507	Object-Oriented Programming Through JAVA Lab (Common to CSE, AI&ML)	0	0	3	1.5
8	23A30502	Python Programming (Common to CSE, AI&ML)	0	1	2	2
9	23A39902	Environmental Science	2	0	0	–
Total			**15**	**2**	**10**	**20**

B.Tech – II Year II Semester

S. No.	Subject Code	Subject	L/D	T	P	Credits
1	23A43901	Optimization Techniques	2	0	0	2
2	23A45102	Probability & Statistics (Common to CSE, AI&ML)	3	0	0	3
3	23A43902	Machine Learning	3	0	0	3
4	23A40502	Database Management Systems (Common to CSE, AI&ML)	3	0	0	3
5	23A43903	Digital Logic and Computer Organization	3	0	0	3
6	23A43904	AI & ML Lab	0	0	3	1.5
7	23A40505	Database Management Systems Lab (Common to CSE, AI&ML)	0	0	3	1.5
8	23A40506	Full Stack Development – I (Common to CSE, AI&ML)	0	1	2	2
9	23A49901	Design Thinking & Innovation	1	0	2	2
Total			**15**	**1**	**12**	**21**

Mandatory Community Service Project / Internship

Duration: 08 weeks (during summer vacation)

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B.Tech – R23 CURRICULUM
B.Tech – (Artificial Intelligence & Machine Learning)

L	T	P	C
3	0	0	3

(23A15201) ENGINEERING PHYSICS
(Common to CIVIL, MECH, CHEM, AI&ML)

COURSE OBJECTIVES,

1 Bridging the gap between the Physics in school at 10+2 level and UG level engineering courses,
2 To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications,
3 Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law – Learning the structural analysis through X-ray diffraction techniques,
4 Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of de Broglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals,
5 To Understand the Physics of Semiconductors and their working mechanism, Concepts utilization of transport phenomenon of charge carriers in semiconductors, To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications,
6 To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices,

COURSE OUTCOMES (COs)

CO1, Explain the need of coherent sources and the conditions for sustained interference (L2), Identify the applications of interference in engineering (L3), Analyze the differences between interference and diffraction with applications (L4), Illustrate the concept of polarization of light and its applications (L2), Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2),

CO2, Interpret various crystal systems (L2), Analyze the characterization of materials by XRD (L4), Identify important properties of crystals like long-range order and periodicity (L3), Structure determination using X-ray diffraction technique (L3), Analysis of structure of crystals by Laue's method (L2),

CO3, Describe the dual nature of matter (L1), Explain the significance of wave function (L2), Identify the role of Schrödinger's time-independent wave equation in a particle in 1D infinite potential well (L3), Identify the role of classical and quantum free electron theory in electrical conductivity (L3),

CO4, Classify crystalline solids (L2), Outline properties of charge carriers in semiconductors (L2), Identify semiconductor type using Hall effect (L2), Classify superconductors based on Meissner's effect (L2), Explain Meissner's effect, BCS theory and Josephson effect (L2),

CO5, Explain dielectric constant and polarization (L2), Summarize various types of polarization (L2), Interpret Lorentz field and Clausius–Mossotti relation (L2), Classify magnetic materials based on susceptibility (L2),

UNIT–I: Wave Optics,Interference – Principle of superposition – Interference of light – Conditions for sustained interference – Thin film interference (Reflection geometry) – Colors in thin films – Newton's Rings – Determination of wavelength and refractive index, Diffraction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit, N-slits (qualitative) – Diffraction grating – Dispersive power – Resolving power (qualitative),Polarization – Types of polarization – Polarization by reflection, refraction, double refraction – Nicol's Prism – Half-wave plate – Quarter-wave plate,

UNIT–II: Crystallography and X-ray Diffraction,

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Crystal systems Bravais Lattices — Coordination number - Packing fraction of SC, BCC & FCC - Miller indices – Separation between successive (h k l) planes. X-ray diffraction: Bragg's law - X-ray Diffractometer – Crystal structure determination by Laue's method.

UNIT–III: Quantum Mechanics and Free Electron Theory,

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle - Schrodinger's time independent and dependent wave equation – Significance and properties of wave function – Particle in a one-dimensional infinite potential well. Free Electron Theory- Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – Equation for electrical conductivity based on quantum free electron theory – Fermi-Dirac distribution – Fermi energy - Failures of free electron theory.

UNIT–IV: Semiconductors and Superconductors,

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers - Drift and diffusion currents – Einstein's equation - Hall effect and its Applications. Superconductors: Introduction – Properties of superconductors – Meissner effect– Type I and Type II superconductors – AC and DC Josephson effects – BCS theory (qualitative treatment) – High Tc superconductors – Applications of superconductors.

UNIT–V: Dielectric and Magnetic Materials,

Dielectric Materials- Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations-Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz field - Clausius-Mossotti equation - Dielectric loss. Magnetic Materials- Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and Permeability – Atomic origin of magnetism – Classification of magnetic materials: Dia, Para, Ferro, Ferri & Antiferro – Domain concept of Ferromagnetism (Qualitative) – Hysteresis – Soft and Hard magnetic materials.

Text Books,

1. Engineering Physics by M. N. Avadhanulu, P. G. Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition, 2019,
2. Engineering Physics by D. K. Bhattacharya and Poonam Tandon, Oxford Press, 2018,
3. Applied Physics by P. K. Palanisamy, SciTech Publications, 2018,

Reference Books,

1. Engineering Physics – B. K. Pandey and S. Chaturvedi, Cengage Learning,
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons,
3. Fundamentals of Physics with Applications – Arthur Beiser, Samarjit Sengupta, Schaum Series,
4. Engineering Physics – Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018,
5. Engineering Physics – Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press,
6. Semiconductor Physics and Devices: Basic Principle – A. Donald Neamen, McGraw Hill,
7. Solid State Physics – A. J. Dekker, Pan Macmillan Publishers,
8. Introduction to Solid State Physics – Charles Kittel, Wiley,

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B.Tech – (Artificial Intelligence & Machine Learning)

L	T	P
3	0	0

(23A15101)LINEAR ALGEBRA & CALCULUS
(Common to All Branches)

Course Objectives:

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

Course Outcomes:

At the end of the course, the student will be able to

CO1: Develop and use of matrix algebra techniques that are needed by engineers for the practical applications.
CO2: Utilize mean value theorems to real life problems.
CO3: Familiarize with functions of several variables which is useful in optimization.
CO4: Learn important tools of calculus in higher dimensions.
CO5: Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

UNIT I – Matrices

Rank of a matrix by echelon form, normal form, Cauchy–Binet formulae (without proof), Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT II – Eigenvalues, Eigenvectors and Orthogonal Transformation

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

UNIT III – Calculus

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT IV – Partial Differentiation and Applications (Multivariable Calculus)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables, Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V – Multiple Integrals (Multivariable Calculus)

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Textbooks:

1. *Higher Engineering Mathematics*, B.S. Grewal, Khanna Publishers, 2017, 44th Edition.
2. *Advanced Engineering Mathematics*, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

Reference Books:

1. *Thomas Calculus*, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. *Advanced Engineering Mathematics*, R.K. Jain and S.R.K. Iyengar, Alpha Science International Ltd., 2021, 5th Edition (9th reprint).
3. *Advanced Modern Engineering Mathematics*, Glyn James, Pearson Publishers, 2018, 5th Edition.
4. *Advanced Engineering Mathematics*, Micheael Greenberg, Pearson Publishers, 9th edition.
5. *Higher Engineering Mathematics*, H.K. Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).

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B.Tech – (Artificial Intelligence & Machine Learning)

L	T	P
3	0	0

(23A12401) BASIC ELECTRICAL & ELECTRONICS ENGINEERING

(Common to CIVIL, MECH, CHEM, AI&ML)

Course Objectives (23A12401)

To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes:

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

CO1: Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
CO2: Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.
CO3: Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.
CO4: Analyze different electrical circuits, performance of machines and measuring instruments.
CO5: Evaluate different circuit configurations, Machine performance and Power systems operation.

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I – DC & AC Circuits

DC Circuits:

Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits:

A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II – Machines and Measuring Instruments

Machines:

Construction, principle and operation of
(i) DC Motor,(ii) DC Generator,(iii) Single Phase Transformer,(iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments:

Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT III – Energy Resources, Electricity Bill & Safety Measures

Energy Resources:

Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill:

Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc.
Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures:

Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.

Personal safety measures:

Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Textbooks:

1. Basic Electrical Engineering, D.C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition.
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013.
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.

Reference Books:

1. Basic Electrical Engineering, D.P. Kothari and I.J. Nagrath, McGraw Hill, 2019, Fourth Edition.
2. Principles of Power Systems, V.K. Mehtha, S. Chand Technical Publishers, 2020.
3. Basic Electrical Engineering, T.K. Nagsarkar and M.S. Sukhija, Oxford University Press, 2017.
4. Basic Electrical and Electronics Engineering, S.K. Bhatacharya, Pearson Publications, 2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.

Course Outcomes:

CO1: Apply the concept of science and mathematics to understand the working of diodes, transistors, and their applications.
CO2: Explain the characteristics of diodes and transistors.
CO3: Familiarize with the number systems, codes, Boolean algebra and logic gates.

C04: Understand the working mechanism of different combinational, sequential circuits and their role in the digital systems.

UNIT I :
SEMI CONDUCTOR DEVICES
Introduction - Evolution of electronics – Vacuum tubes to nanoelectronics – Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT II :
BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATAION
Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III :
DIGITAL ELECTRONICS
Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits – Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Textbooks:

1. R.L.Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education,2021.
2. R.P.Jain,Modern Digital Electronics,4th Edition,Tata Mc Graw Hill,2009

Reference Books:

1. R.S.Sedha, ATextbook of Electronic Devices and Circuits,S.Chand&Co,2010.
2. Santiram Kal, Basic Electronics-Devices, Circuits and IT Fundamentals, Prentice Hall, India,2002.
3. R.T.Paynter, Introductory Electronic Devices & Circuits–Conventional Flow Version, Pearson Education,2009.

C04: Understand the working mechanism of different combinational, sequential circuits and their role in the digital systems.

UNIT I : SEMI CONDUCTOR DEVICES
Introduction - Evolution of electronics – Vacuum tubes to nanoelectronics – Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT II : BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATAION
Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III : DIGITAL ELECTRONICS
Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits – Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Textbooks:

1. R.L.Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education,2021.
2. R.P.Jain,Modern Digital Electronics,4th Edition,Tata Mc Graw Hill,2009

Reference Books:

1. R.S.Sedha, ATextbook of Electronic Devices and Circuits,S.Chand&Co,2010.
2. Santiram Kal, Basic Electronics-Devices, Circuits and IT Fundamentals, Prentice Hall, India,2002.
3. R.T.Paynter, Introductory Electronic Devices & Circuits–Conventional Flow Version, Pearson Education,2009.

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B. TECH R23 CURRICULUM

B. Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

IYear B. Tech. AI & ML–I Semester

L	T	P	C
1	0	4	3

Course Objectives:

(23A10301) ENGINEERING GRAPHICS

(Commonto CIVIL,MECH,CHEM,AI&ML)

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing.
- To impart knowledge on the projection of points, lines and plane surfaces.
- To improve the visualization skills for better understanding of projection of solids.
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

Course Outcomes:

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
CO3: Understand and draw projection of solids in various positions in first quadrant.
CO4: Explain principles behind development of surfaces.
CO5: Prepare isometric and perspective sections of simple solids.

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.
Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.
Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes.

Projections of Planes: Regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids : Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Developmentof Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views, Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D & 3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination).

Textbook:

1. N.D.Bhatt, Engineering Drawing, Charotar Publishing House,2016.

Reference Books:

1. Engineering Drawing, K.L.Narayanaand P.Kannaiah,Tata Mc Graw Hill,2013.
2. Engineering Drawing,M.B.Shahand B.C.Rana,Pearson Education Inc,2009.
3. Engineering Drawingwithan Introductionto Auto CAD,Dhananjay Jolhe,Tata Mc Graw Hill,2017.

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B. TECH R23 CURRICULUM

B. Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

IYear B.Tech.AI&ML–ISemester

L	T	P	C
3	0	0	3

(23A10501) INTRODUCTION TO PROGRAMMING

(Common to All branches)

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

Course Outcomes: A student after completion of the course will be able to
CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.
CO2: Analyse a problem and develop an algorithm to solve it.
CO3: : Implement various algorithms using the C programming language.
CO4: Understand more advanced features of C language.
CO5: Develop problem-solving skills and the ability to debug and optimize the code.

UNIT I : Introduction to Programming and Problem Solving
History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program - Algorithms, flowcharts (Using Dia Tool), pseudocode. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.
Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT II : Control Structures
Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

UNIT III : Arrays and Strings
Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

UNIT IV : Pointers & User Defined Data types
Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types - Structures and Unions.

UNIT V : Functions & File Handling
Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers,arrays as parameters.Scope and Life time of Variables,Basicsof File Handling

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING(AUTONOMOUS): ANANTHAPURAMU–515002(A.P) INDIA

B. TECH R23 CURRICULUM

B. Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

Note : The syllabus is designed with C Language as the fundamental language of implementation**.**

Textbooks:

1. "The C Programming Language", Brian W.Kernighanand Dennis M.Ritchie,Prentice-Hall,1988.
2. Schaum's Outline of Programming with C,Byron SGottfried,Mc Graw-Hill Education,1996.

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy,E.,Mc Graw-Hill Education,2008.
2. Programming in C, Rema Theraja,Oxford,2016,2nd edition.
3. C Programming, A Problem Solving Approach,Forouzan,Gilberg,Prasad,CENGAGE,3rd edition.

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COLLEGE OF ENGINEERING(AUTONOMOUS): ANANTHAPURAMU–515002(A.P) INDIA

B. TECH R23 CURRICULUM

B. Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

IYear B.Tech.AI&ML–ISemester

(2310503)IT WORKSHOP

(Common to CIVIL,MECH,CHEM,AI&ML)

L	T	P	C
0	0	2	1

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables.
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS.
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning.
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spreadsheets and Presentation tools.

Course Outcomes:

CO1: Perform Hardware trouble shooting.
CO2: Understand Hardware components and interdependencies.
CO3: Safeguard computer systems from viruses/worms.
CO4: Document/Presentation preparation.
CO5: Perform calculations using spreadsheets..

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.
Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.
Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.
Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.
Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting.

Finally students should demonstrate, to the instructor, how to access the websites an demail. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.
Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block popups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La Te X and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La Te X and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La Te X and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
Task 2: Using La Te X and Word to create a project certificate. Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La Te X and Word.
Task 3: Creating project abstract Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
Task 4: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

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

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, autofill, Formatting Text.
Task 2: Calculating GPA - . Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

LOOKUP/VLOOKUP

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

POWERPOINT

Task 1: Students will be working on basic powerpoint utilities and tools which help them create basic powerpoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in Power Point.
Task 2: Interactive presentations - Hyperlinks, Inserting – Images, Clip Art, Audio, Video, Objects, Tables and Charts.
Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slideslotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – Chat GPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.
Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"
Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."
Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

Comdex Information Technology course toolkit, Vikas Gupta, WILEY Dreamtech, 2003
The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dreamtech, 2013, 3rd edition
Introduction to Information Technology, IT Education Solutions limited, Pearson Education, 2012, 2nd edition
PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
La Te X Companion, Leslie Lamport, PHI/Pearson.
IT Essentials PC Hardware and Software Companion Guide, David Anfinson and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan – CISCO Press, Pearson Education, 3rd edition

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COLLEGE OF ENGINEERING(AUTONOMOUS): ANANTHAPURAMU–515002(A.P) INDIA

B. TECH R23 CURRICULUM

B. Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

IYear B.Tech.AI&ML–ISemester

(23A15202) ENGINEERING PHYSICS LAB

(Common to all Branches)

L	T	P	C
0	0	2	1

Course Objectives:

- ➢ Understands the concepts of interference, diffraction and their applications.
- ➢ Understand the role of optical fiber parameters in communication.
- ➢ Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor.
- ➢ Illustrates the magnetic and dielectric materials applications.
- ➢ Apply the principles of semiconductors in various electronic devices.

Course Outcomes: The students will be able to

CO1: Bridging the gap between the Physics in school at 10+2 level and UG level engineering courses.

CO2: To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications.

CO3: Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law – Learning the structural analysis through X-ray diffraction techniques.

CO4: Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of de Broglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals.

CO5: Calculate the band gap of a given semiconductor.

CO6: Identify the type of semiconductor using Halleffect.

List of Engineering Physics Experiments :

1. Determination of radius of curvature of a given plano convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Determination of dispersive power of prism.
4. Verification of Brewster's law
5. Determination of the resistivity of semiconductor by four probe method.
6. Determination of energy gap of a semiconductor using p-n junction diode.
7. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
8. Determination of dielectric constant using charging and discharging method.
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method.
11. Determination of wavelength of Laser light using diffraction grating.
12. Estimation of Planck's constant using photoelectric effect.
13. Determination of temperature coefficients of a thermistor.
14. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non- uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any TEN of the listed experiments are to be conducted.Out of which any TWO experiments may be conducted in virtual mode.

References:

1. ATextbookof Practical Physics-S.Balasubramanian,M.N.Srinivasan,S.Chand Publishers,2017.

Web Resources

1. www.vlab.co.in
2. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

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B. TECH R23 CURRICULUM

B. Tech. – (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

I year B. Tech.AI & ML–I Semester

L	T	P	C
0	0	3	1.5

(23A12402) ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

(Common to CIVIL, MECH, CHEM, AI&ML)

Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits ,functions of electrical machines and energy calculations.

Course Outcomes:

CO1: Understand the Electrical circuit design concept; measurement of resistance ,power ,powerfactor ;concept of wiring and operation of Electrical Machines and Transformer.
CO2: Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments;
Calculations for the measurement of resistance ,power and powerfactor.
CO3: Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and powerfactor.
CO4: Analyse various characteristics of electrical circuits , electrical machines and measuring instruments.
CO5: Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

Activities:

Familiarization of commonly used Electrical & Electronic Workshop Tools : Breadboard ,Solder ,cables, relays , switches , connectors ,fuses ,Cutter ,plier ,screw driver set ,wires tripper, flux ,knife /blade ,soldering iron ,de-soldering pump etc.
Provide some exercises so that hardware tools and instruments are learned to be used by the students.
Familiarization of Measuring Instruments like Voltmeters ,Ammeters ,multimeter ,LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
Provide some exercises so that measuring instruments are learned to be used by the students.

Components:

Familiarization / Identification of components (Resistors ,Capacitors ,Inductors ,Diodes ,transistors ,IC's etc.) – Functionality ,type , size , colour coding package, symbol, cost etc.
Testing of components like Resistor , Capacitor , Diode , Transistor , ICs etc.-Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments.

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheatstone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

Reference Books:

1. Basic Electrical Engineering, D.C.Kulshreshtha, TataMcGrawHill ,2019 ,First Edition.
2. Power System Engineering, P.V.Gupta ,M.L.Soni ,U.S.Bhatnagarand A.Chakrabarti, Dhanpat Rai & Co, 2013.
3. Fundamentals of Electrical Engineering ,Rajendra Prasad, PHI publishers ,2014,Third Edition.

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

Course Objectives:

To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

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

CO1: Identify & testing of various electronic components.
CO2: Understand the usage of electronic measuring instruments.
CO3: Plot and discuss the characteristics of various electron devices.
CO4: Explain the operation of a digital circuit.

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V–I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R ,J-K & D flip flops using respective ICs.

Tools / Equipment Required : DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters ,AC Voltmeters ,CROs, all the required active devices.

References:

1. R.L.Boylestad & Louis Nashlesky ,Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R.P.Jain, Modern Digital Electronics, 4thEdition, Tata McGrawHill,2009
3. R.T.Paynter, Introductory Electronic Devices & Circuits–Conventional Flow Version, Pearson Education,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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B. TECH R23 CURRICULUM

B. Tech. – (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

IYearB.Tech.AI&ML–ISemester

L	T	P	C
0	0	3	1.5

(23A1502P) COMPUTER PROGRAMMING LAB

(Common to all branches)

Course Objectives:

The course aims to give students hands–on experience and train them on the concepts of the C-programming language.

Course Outcomes:

CO1: Read, understand, and trace the execution of programs written in C language.
CO2: Select the right control structure for solving the problem.
CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.
CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

UNIT I

WEEK1

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments / Activities:

Tutorial1: Problem-solving using Computers.

Lab1:

1. Familiarization with programming environment
2. Basic Linux environment and its editors like Vi, Vim & Emacs etc.
3. Exposure to Turbo C , gcc
4. Writing simple programs using printf(), scanf()

WEEK2

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments/Activities:

Tutorial2: Problem-solving using Algorithms and Flowcharts.

Lab1:

1. Converting algorithms /flow charts into C Source code.
2. Developing the algorithms / flow charts for the following sample programs
3. Sum and average of 3 numbers
4. Conversion of Fahrenheit to Celsius and vice versa
5. Simple interest calculation

WEEK3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments / Activities:

Tutorial3: Variable types and type conversions:

Lab3:

1. Simple computational problems using arithmetic expressions.
2. Finding the square root of a given number
3. Finding compound interest
4. Area of a triangle using heron's formulae
5. Distance travelled by an object

UNITII

WEEK4

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments / Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4:

1. Simple computational problems using the operator' precedence and associativity
    a. Evaluate the following expressions.
    b. A+B*C+(D*E)+F*G
    c. A/B*C-B+A*D/3
    d. A+++B---A
    e. J=(i++)+(++i)
2. Find the maximum of three numbers using conditional operator
3. Take marks of 5 subjects in integers, and find the total, average in float

WEEK5

Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-elseif *-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments / Activities:

Tutorial5: Branching and logical expressions:

Lab5: Problems involving if-then-else structures.

1. Write a C program to find the max and min off our numbers using if-else.
2. Write a C program to generate electricity bill.
3. Find the roots of the quadratic equation.
4. Write a C program to simulate a calculate or using switch case.
5. Write a C program to find the given year is a leap year or not.

WEEK6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:
Tutorial6: Loops, while and for loops
Lab6:

1. Iterative problems e.g., the sum of series
2. Find the factorial of given number using any loop.
3. Find the given number is a prime or not.
4. Compute sine and cos series
5. Checking a number palindrome
6. Construct a pyramid of numbers.

UNITIII
WEEK7:
Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:
Tutorial7: 1DArrays: searching.
Lab7:

1. 1D Array manipulation, linear search
2. Find the min and max of a 1-D integer array.
3. Perform linear search on 1D array.
4. The reverse of a 1D integer array
5. Find 2's complement of the given binary number.
6. Eliminate duplicate elements in an array.

WEEK8:
Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:
Tutorial8: 2Darrays, sorting and Strings.
Lab8:

1. Matrix problems, String operations, Bubble sort
2. Addition of two matrices
3. Multiplication two matrices
4. Sort array elements using bubble sort
5. Concatenate two strings without built-in functions
6. Reverse a string using built-in and without built-in string functions

UNITIV
WEEK9:
Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & amp ; value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc(), calloc(), realloc() and free() functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial9: Pointers, structures and dynamic memory allocation

Lab9:

Pointers and structures , memory dereference.

1. Write a C program to find the sum of a 1D array using malloc()
2. Write a C program to find the total, average of n students using structures
3. Enter n students data using calloc() and display failed students list
4. Read student name and marks from the command line and display the student details along with the total.
5. Write a C program to implement realloc()

WEEK10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial10: Bit fields, Self-Referential Structures, Linked lists

Lab10:

Bit fields , linked lists

1. Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields
2. Create and display a singly linked list using self-referential structure.
3. Demonstrate the differences between structures and unions using a C program.
4. Write a C program to shift/rotate using bit fields.
5. Write a C program to copy one structure variable to another structure of the same type.

UNIT V

WEEK11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration.

Suggested Experiments/Activities:

Tutorial11: Functions, call by value, scope and extent,

Lab11:

1. Simple functions using call by value, solving differential equations using Eulers theorem.
2. Write a C function to calculate NCR value.
3. Write a C function to find the length of a string.
4. Write a C function to transpose of a matrix.
5. Write a C function to demonstrate numerical integration of differential equations using Euler's method.

WEEK12:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab12: Recursive functions

1. Write a recursive function to generate Fibonacci series.
2. Write a recursive function to find the lcm of two numbers.

3. Write a recursive function to find the factorial of a number.
4. Write a C Program to implement Ackermann function using recursion.
5. Write a recursive function to find the sum of series.

WEEK13:
Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers
Suggested Experiments/Activities:
Tutorial13: Call by reference, dangling pointers
Lab13:

1. Simple functions using Call by reference, Dangling pointers.
2. Write a C program to swap two numbers using call by reference.
3. Demonstrate Dangling pointer problem using a C program.
4. Write a C program to copy one string into another using pointer.
5. Write a C program to find no of lower case, upper case, digits and other characters using pointers.

WEEK14:
Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:
Tutorial14: File handling
Lab14: File operations

1. Write a C program to write and read text into a file.
2. Write a C program to write and read text into a binary file using fread() and fwrite()
3. Copy the contents of one file to another file.
4. Write a C program to merge two files into the third file using command-line arguments.
5. Find no.of lines, words and characters in a file.
6. Write a C program to print last n characters of a given file.

Textbooks:

1. Ajay Mittal ,Programming in C: A practical approach ,Pearson.
2. Byron Gottfried, Schaum Outline of Programming with C,McGrawHill.

Reference Books:

1. Brian W.Kernighan and Dennis M.Ritchie, The C Programming Language, Prentice-Hall of India.
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad,CENGAGE

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING(AUTONOMOUS): ANANTHAPURAMU–515002(A.P) INDIA

B. TECH R23 CURRICULUM

B. Tech. – (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

IYearB.Tech.AI&ML–ISemester

L	T	P	C
0	0	1	0.5

(23A15902)NSS/NCC/SCOUTS&GUIDES/COMMUNITY SERVICE

(Common to CIVIL, MECH, CHEM, AI&ML)

Course Objectives:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

Course Outcomes:

After completion of the course the students will be able to

CO1: Understand the importance of discipline, character and service motto.
CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.
CO3: Explore human relationships by analyzing social problems.
CO4: Determine to extend their help for the fellow beings and down trodden people.
CO5: Develop leadership skills and civic responsibilities.

UNITI: Orientation

General Orientation on NSS/ NCC/ Scouts & Guides/ Community Service activities, career guidance.

Activities:

Conducting–ice breaking sessions-expectations from the course-knowing personal talents and skills
Conducting orientations programs for the students–future plans-activities-releasing road map etc.
Displaying success stories-motivational biopics-award winning movies on societal issues etc.
Conducting talent show in using patriotic songs-paintings-any other contribution.

UNITII: Nature & Care Activities:

Best out of waste competition. Poster and signs making competition to spread environmental awareness. Recycling and environmental pollution article writing competition. Organising Zero-waste day. Digital Environmental awareness activity via various social media platforms. Virtual demonstration of different eco friendly approaches for sustainable living. Write a summary on any book related to environmental issues.

UNIT III: Community Service Activities:

Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems-helping them to solve via media-authorities-experts-etc. Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS, Conducting consumer Awareness. Explaining various legal provisions etc. Women Empowerment Programs- Sexual Abuse, Adolescent Health and Population Education. Any other programs in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *RedBook-National Cadet Corps*–Standing Instructions VolI &II ,Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M.L .and Cornwell D.A.,"Introduction to Environmental Engineering", McGrawHill, New York4/e2008
4. Masters G.M., Joseph K. and NagendranR. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, NewDelhi.

General Guidelines:

Institutes must assigns lots in the Time table for the activities.
Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

Evaluated for a total of 100 marks.
A student can select 6 activities of his/her choice with a minimum of 01 activity per unit . Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING(AUTONOMOUS)::ANANTHAPURAMU–515002(A.P)INDIA

B.TECH R23 CURRICULUM.

B.Tech (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

I Year B.Tech.AI & ML – II Semester

L	T	P	C
2	0	0	2

(23A25501) COMMUNICATIVE ENGLISH

(Common to CIVIL,MECH,CHEM,AI&ML)

Course Objectives:

- The main objective of introducing this course, *Communicative English,* is to facilitate effective listening, Reading, Speaking and Writing skills among the students.
- It enhances the same in their comprehending abilities,oral presentations,reporting useful information and providing knowledge of grammatical structures and vocabulary.
- This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

Course Outcomes :

CO1 :Understand the context, topic, and pieces of specific information from social or Transactional dialogues.
CO2 : Apply grammatical structures to formulate sentences and correct wordforms.
CO3 : Analyze discourse markers to speak clearly on a specific topic in informal discussions
CO4 : Evaluate reading/ listening texts and to write summaries based on global–Comprehension of these texts.
CO5 : Create a coherent paragraph, essay and resume.

UNIT I :

Lesson: HUMAN VALUES: Gift of Magi **(Short Story)**
Listening : Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking : As king and answering general questions on familiar topics such as home, family,work,studies and interests; introducing oneself and others.
Reading : Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing : Mechanics of Writing-Capitalization,Spellings,Punctuation-Parts of sentences.
Grammar : Parts of Speech,Basic Sentence Structures-forming questions
Vocabulary : Synonyms,Antonyms,Affixes(Prefixes/Suffixes),Rootwords.

UNIT II :

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)
Listening : Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
Speaking : Discussion in pairs/small groups on specific topics followed by short structure talks. **Reading :**Identifying sequence of ideas;recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing : Structure of a paragraph-Paragraph writing(specific topics) .

Grammar : Cohesive devices-linkers,use of articles and zero article; prepositions
Vocabulary : Homonyms,Homophones, Homographs.

UNIT III :
Lesson :BIOGRAPHY: Elon Musk
Listening : Listening for global comprehension and summarizing what is listened to.
Speaking : Discussing specific topics in pairs or small groups and reporting what is discussed.
Reading : Reading a text in detail by making basic inferences-recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing : Summarizing, Note-making,paraphrasing
Grammar : Verbs-tenses;subject-verb agreement;Compound words,Collocations
Vocabulary : Compound words, Collocations

UNIT IV :
Lesson :INSPIRATION :The Toys of Peace by Saki

Listening : Making predictions while listening to conversations/transactional dialogues without video; listening with video.
Speaking : Roleplays for practice of conversational English in academic contexts(formal and informal) - asking for and giving information/directions.
Reading : Studying the use of graphic elements in texts to convey information,reveal trends /patterns/relationships,communicate processesor display complicated data.
Writing : Letter Writing:Official Letters, Resumes
Grammar : Reporting verbs,Direct &Indirect speech,Active &Passive Voice **Vocabulary :**Words often confused,Jargons.

UNIT V :
Lesson :MOTIVATION :The Power of Intrapersonal Communication(An Essay)
Listening : Identifying key terms,understanding concepts and answering a series of relevant questions that test comprehension.
Speaking : Formal oral presentations on topics from academic contexts
Reading : Reading comprehension.
Writing : Writing structured essays on specific topics.
Grammar : Editing short texts–identifying and correcting common errors in grammar and usage(articles, prepositions, tenses, subject verb agreement)
Vocabulary : Technical Jargons.

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B.TECH R23 CURRICULUM B.Tech.

–(ARTIFICIAL INTELLENCE & MACHINE LEARNING)

Textbooks:

1. Pathfinder :Communicative English for Undergraduate Students,1st Edition,Orient BlackSwan,2023 (Units 1,2 & 3)
   Empowering with Language by Cengage Publications,2023(Units 4&5)

Reference Books:

1. Dubey,ShamJi & Co.English for Engineers, Vikas Publishers,2020
2. Bailey,Stephen.Academic writing:A Handbook for International Students.Routledge,2014.
3. Murphy,Raymond.English Grammar in Use,FourthEdition,Cambridge University Press,2019.
4. Lewis,Norman.Word Power Made Easy-The Complete Hand book for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

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B.TECH R23 CURRICULUM

B.Tech.–(ARTIFICIAL INTELLENCE & MACHINE LEARNING)

I YearB.Tech.AI & ML–II Semester

L	T	P	C
3	0	0	3

(23A25303) CHEMISTRY

(Common to CSE,ECE,EEE,AI&ML)

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
  To introduce instrumental methods,molecular machines and switches.

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

CO1 : Compare the materials of construction for battery and electro chemical sensors.

CO2 :Explain the preparation,properties,and applications of thermoplastics &thermosetting &elastomers conducting polymers.

CO3 :Explain the principles of spectrometry,slc inseparation of solid and liquid mixtures.

CO4 : Apply the principle of Band diagrams in the application of conductors and semiconductors.

CO5 : Summarize the concepts of Instrumental methods.

UNIT I :Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation,significance of Ψ and Ψ^2,particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbital's of butadiene and benzene, calculation of bond order.

UNIT II :Modern Engineering materials Semi conductors–Introduction,basic concept,application Super conductors-Introduction basic concept, applications.

Super capacitors : Introduction,Basic Concept-Classification–Applications.

Nanomaterials : Introduction,classification,properties and applications of Fullerenes,carbon nanotubes and Graphines nanoparticles.

UNIT III : Electrochemistry and Applications

Electrochemical cell, Nernst equation,cell potential calculations and numerical problems,potentiometry-potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conduct metric titrations (acid-base titrations). Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions;Fuel cells, hydrogen-oxygen fuel cell–working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT IV : Polymer Chemistry

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

Plastics–Thermo and Thermosetting plastics, Preparation, properties and applications of –PVC,Teflon, Bakelite,Nylon-6,6,carbon fibres.Elastomers–Buna-S,Buna-N–preparation,properties and applications. Conducting polymers –polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid(PLA).

UNIT V : Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation.Chromatography-Basic Principle,Classification-HPLC:Principle,Instrumentation and Applications.

Textbooks:

1. Jain and Jain,Engineering Chemistry,16/e,Dhanpat Rai,2013.
2. Peter Atkins,Juliode Paula and James Keeler,Atkins Physical Chemistry,10/e,Oxford University Press, 2010.

Reference Books:

1. Skoog and West,Principles of InstrumentalAnalysis,6/e,Thomson,2007.
2. J.D.Lee,Concise Inorganic Chemistry,5thEdition,Wiley Publications,Feb.2008
3. Textbook of Polymer Science,Fred W. BillmayerJr,3rdEdition

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B.TECH R23 CURRICULUM

B.Tech.–(ARTIFICIAL INTELLENCE & MACHINE LEARNING)

I Year B.Tech.AI & ML–II Semester

L	T	P	C
3	0	0	3

(23A25101)DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All Branches)

Course Objectives:

- To enlighten the learners in the concept of differential equations and multi variable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead the min to advanced level by handling various real-world applications.

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

CO1 :Solve the differential equations related to various engineering fields.

CO2 : Identify solution methods for partial differential equations that model physical processes.

CO3 : Interpret the physical meaning of different operators such as gradient, Curl and divergence. **CO4:** Estimate the work done against afield, circulation and flux using vector calculus.

UNIT I : Differential equations of first order and first degree

Linear differential equations–Bernoulli's equations-Exact equations and equations reducible to exact form.Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT II : Linear differential equations of higher order(Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian,Method of variation of parameters.Simultaneous linear equations, Applications to L-C- R Circuit problems and Simple Harmonic motion.

UNIT III : Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions,solutions of first order linear equations using Lagrange's method.Homogeneous Linear Partial differential equations with constant coefficients.

UNIT IV : Vector differentiation

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V : Vector integration

L Without integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem(without proof),volume integral, Divergence theorem(without proof)and related problems.

Textbooks:

1. Higher Engineering Mathematics,B.S.Grewal,KhannaPublishers,2017,44thEdition
2. Advanced Engineering Mathematics, Erwin Kreyszig,John Wiley&Sons,2018,10thEdition.

Reference Books:

1. Thomas Calculus, George B.Thomas,Maurice D.Weirand Joel Hass,Pearson Publishers,2018,14th Edition.
2. Advanced Engineering Mathematics,Dennis G.Zill and WarrenS.Wright,Jones and Bartlett,2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearsonpublishers, 2018,5thEdition.
4. Advanced Engineering Mathematics,R.K.Jain and S.R.K.Iyengar,Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics,B.V.Ramana,McGrawHillEducation,2017

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B.TECH R23 CURRICULUM

B.Tech.–(ARTIFICIAL INTELLENCE & MACHINE LEARNING)

I Year B.Tech. AI&ML–II Semester

L	T	P	C
3	0	0	3

(23A21301)BASIC CIVIL AND MECHANICAL ENGINEERING

(Common to CIVIL, MECH, CHEM, AI & ML)

Course Objectives:

- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality,conveyance and storage of water. Introductiontobasiccivilengineeringmaterialsandconstructiontechniques.

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

CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.

CO2 :Know the concepts of surveying and to understand the measurement of distances,angles and levels through surveying.

CO3 :Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.

CO4 :Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.

CO5 :Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society-Various Disciplines of Civil Engineering-Structural Engineering-Geo-technical Engineering-Transportation Engineering Hydraulics and Water Resources Engineering – Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement –Aggregate Bricks-Cement concrete-Steel. Introduction to Prefabricated construction Techniques.

UNIT II

Surveying: Objectives of Surveying-Horizontal Measurements-Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

UNIT III

Transportation Engineering : Importance of Transportation in Nation's economic development-Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water-Quality of water-Specifications-Introduction to Hydrology–Rain water Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Textbooks:

1. Basic Civil Engineering, M.S. Palanisamy, Tata Mcgraw Hill publications(India)Pvt.Ltd.Fourth Edition.
2. Introduction to Civil Engineering,S.S.Bhavi katti,New Age InternationalPublishers.2022.First Edition.
3. Basic Civil Engineering , Satheesh Gopi, PearsonPublications,2009,FirstEdition.

Reference Books:

1. Surveying,Vol-I and Vol-II, S.K.Duggal, Tata McGrawHillPublishers2019.FifthEdition.
2. Hydrology and Water Resources Engineering ,Santosh KumarGarg, KhannaPublishers,Delhi.2016
3. Irrigation Engineering and Hydraulic Structures-Santosh Kumar Garg,Khanna Publishers,Delhi 2023. 38th Edition.
4. Highway Engineering,S.K.Khanna,C.E.G.Justo and Veera raghavan,Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER—SPECIFICATIONIS10500-2012.

PART B :BASIC MECHANICAL ENGINEERING

Course Objectives: The students after completing the course are expected to

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

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

CO1: Understand the different manufacturing processes.

CO2: Explain the basics of thermal engineering and its applications.

CO3: Describe the working of different mechanical power transmission systems and powerplants.

CO4:Describe the basics of robotics and its applications.

UNIT I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials-Metals-Ferrous and Non-ferrous,Ceramics,Composites,Smart materials.

UNIT II

Manufacturing Processes: Principles of Casting**,**Forming, joining processes, Machining,Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles,IC engines,2-Strokeand4-Stroke engines,SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT III

Power plants–working principle of Steam, Diesel, Hydro, Nuclear powerplants.

Mechanical Power Transmission-Belt Drives, Chain, Rope drives, Gear Drives and the its applications.

Introduction to Robotics -Joints &links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

Textbooks:

1. Internal Combustion Engines by V.Ganesan,By Tata McGraw Hill publications(India)Pvt.Ltd.
2. A Textbook of Theory of Machines by S.S.Rattan, TataMcGraw HillPublications,(India)Pvt.Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

ReferenceBooks:

1. Appuu Kuttan KK,Robotics,I.K.International Publishing House Pvt.Ltd.Volume-I
2. 3D printing & Additive Manufacturing Technology-L. Jyothish Kumar,Pulak M Pandey,Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications(India)Pvt.Ltd.
4. G.Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering,Tata McGrawHill publications (India) Pvt. Ltd.

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B.TECHR23CURRICULUM

L	T	P	C
3	0	0	3

(23A20501) DATA STRUCTURES

(Common to CSE, & AI & ML)

Course Objectives

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

Course Outcomes:

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

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.

CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.

CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.

CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs, and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.

CO5: Devise novel solutions to small-scale programming challenges involving data structures such as stacks, queues, and trees.

CO6: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

UNIT I

Introduction to Linear Data Structures:
Definition and importance of linear data structures, Abstract Data Types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures.

Searching Techniques:
Linear & Binary Search

Sorting Techniques:
Bubble Sort, Selection Sort, Insertion Sort

UNIT II

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, comparing arrays and linked lists, applications of linked lists.

UNIT III

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, applications of stacks in expression evaluation, backtracking, reversing list, etc.

UNIT IV

Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, applications of queues in breadth-first search, scheduling, etc.

Deques: Introduction to deques (double-ended queues), operations on deques and their applications.

UNIT V

Trees: Introduction to trees, Binary Search Tree – Insertion, Deletion & Traversal.

Hashing: Brief introduction to hashing and hash functions, collision resolution techniques: chaining and open addressing.

Addressing: Hash tables: basic implementation and operations, applications of hashing in unique identifier generation, caching, et

Textbooks:

1. *Data Structures and Algorithm Analysis in C*, Mark Allen Weiss, Pearson, 2nd Edition.
2. *Fundamentals of Data Structures in C*, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008.

Reference Books:

1. *Algorithms and Data Structures: The Basic Toolbox* by Kurt Mehlhorn and Peter Sanders.
2. *C Data Structures and Algorithms* by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft.
3. *Problem Solving with Algorithms and Data Structures* by Brad Miller and David Ranum.
4. *Introduction to Algorithms* by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein.
5. *Algorithms in C, Parts 1–5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms* by Robert Sedgewick.

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B.TECH R23 CURRICULUM
I Year B.Tech AI &ML – II Semester

L	T	P	C
0	0	2	1

(23A25502) COMMUNICATIVE ENGLISH LAB

(Common to CIVIL, MECH, CHEM, AI&ML)

Course Objectives:

The main objective of introducing this course, *Communicative English Laboratory*, is to expose the students to a variety of self-instructional, learner-friendly modes of language learning. The students will get trained in basic communication skills and also be prepared to face job interviews.

Course Outcomes:

CO1: Understand the different aspects of English language proficiency with emphasis on LSRW skills.

CO2: Apply communication skills through various language learning activities.

CO3: Analyze English speech sounds, stress, rhythm, intonation, and syllable division for better listening and speaking comprehension.

CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.

CO5: Create effective communication strategies and demonstrate improved proficiency in real-life situations.

List of Topics:

1. Vowels & Consonants
2. Neutralization / Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover Letter, SOP
7. Group Discussions – Methods & Practice
8. Debates – Methods & Practice
9. PPT Presentations / Poster Presentation
10. Interview Skills

Suggested Software:

1. Walden Infotech
2. Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta Sharma – *Technical Communication*, Oxford Press, 2018.
2. Taylor Grant – *English Conversation Practice*, Tata McGraw-Hill Education India, 2016.
3. Hewings, Martin – *Cambridge Academic English (B2)*, CUP, 2012.
4. J. Sethi & P. V. Dhamija – *A Course in Phonetics and Spoken English* (2nd Ed.), Kindle, 2013

WebResources:

SpokenEnglish:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice&Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

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B.TECH R23 CURRICULUM

L	T	P	C
0	0	2	1

(23A25304) CHEMISTRY LAB

(Common to CSE ,ECE ,EEE , AI&ML)

Course Objectives:

Verify the fundamental concepts with experiments.

Course Outcomes:

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

CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Measure the strength of an acid present in secondary batteries.
CO4: Analyse the IR spectra of some organic compounds.
CO5: Calculate the strength of acid in Pb-Acid battery.

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method
2. Conduct metric titration of strong acid vs. strong base
3. Conduct metric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometer – determination of redox potentials and EMFs
6. Determination of strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

Reference:

Vogel's Quantitative Chemical Analysis, 6th Edition, Pearson Publications, by J. Mendham, R. C. Denney, J. D. Barnes, and B. Sivasankar.

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B.TECH R23 CURRICULUM

L	T	P	C
0	0	3	1.5

(23A20301) ENGINEERING WORKSHOP

(Common to CIVIL, MECH, CHEM, AI&ML)

Course Objective:

To familiarize students with woodworking, sheet metal operations, fitting, and electrical house wiring skills.

Course Outcomes:

CO1: Identify workshop tools and their operational capabilities.
CO2: Practice manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for house wiring practice.

SYLLABUS

Demonstration:
Safety practices and precautions to be observed in the workshop.

Wood Working:
Familiarity with different types of woods and tools used in woodworking and make the following joints:

- Half–Lap joint
- Mortise and Tenon joint
- Corner Dovetail joint or Bridle joint

Sheet Metal Working:
Familiarity with different types of tools used in sheet metal working. Develop the following sheet metal jobs from GI sheets:

- Tapered tray
- Conical funnel
- Elbow pipe
- Brazing

Fitting:
Familiarity with different types of tools used in fitting and perform the following exercises:

- V-fit
- Dovetail fit
- Semi-circular fit
- Bicycle tire puncture and change of two-wheeler tyre

Electrical Wiring:
Familiarity with different types of basic electrical circuits and make the following connections:

- Parallel and series
- Two-way switch
- Godown lighting
- Tube light
- Three-phase motor
- Soldering of wires

Foundry Trade:
Demonstration and practice on moulding tools and processes, preparation of green sand moulds for given patterns.

Welding Shop:
Demonstration and practice on arc welding and gas welding. Preparation of lap joint and butt joint.

Plumbing:
Demonstration and practice of plumbing tools. Preparation of pipe joints with coupling for same diameter and with reducer for different diameters.

Textbooks:

1. *Basic Workshop Technology: Manufacturing Process*, Felix W., Independently Published, 2019.
   Workshop Processes, Practices and Materials, Bruce J. Black, Routledge Publishers, 5th Edn., 2015.
2. *A Course in Workshop Technology Vol I & II*, B. S. Raghuwanshi, Dhanpat Rai & Co., 2015 & 2017.

Reference Books:

1. *Elements of Workshop Technology, Vol. I*, S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai, 2007, 14th edition.
2. *Workshop Practice*, H. S. Bawa, Tata-McGraw Hill, 2004.
3. *Wiring Estimating, Costing and Contracting*, Soni P. M. & Upadhyay P. A., Atul Prakashan, 2021–22.

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B.TECH R23 CURRICULUM

B.Tech.–(ARTIFICIAL INTELLENCE & MACHINE LEARNING)

I Year B.Tech. AI&ML –II Semester

L	T	P	C
0	0	3	1.5

(23A20503) DATA STRUCTURES LAB

(Common to CSE, & AI&ML)

Course Objectives :

The course aims to strengthen the ability of the students to identify and apply the suitable data structure for a given real-world problem. It enables them to gain knowledge in practical applications of data structures.

Course Outcomes:

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

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs, distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.
CO5: Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

List of Experiments:

Exercise 1: Array Manipulation

1. Write a program to reverse an array.
2. C Programs to implement the Searching Techniques – Linear & Binary Search.
3. C Programs to implement Sorting Techniques – Bubble, Selection, and Insertion Sort.

Exercise 2: Linked List Implementation

1. Implement a singly linked list and perform insertion and deletion operations.
2. Develop a program to reverse a linked list iteratively and recursively.
3. Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications

1. Create a program to detect and remove duplicates from a linked list.
2. Implement a linked list to represent polynomials and perform addition.
3. Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation

1. Implement a doubly linked list and perform various operations to understand its properties and applications.
2. Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise 5: Stack Operations

1. Implement a stack using arrays and linked lists.
2. Write a program to evaluate a postfix expression using a stack.
3. Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations

1. Implement a queue using arrays and linked lists.
2. Develop a program to simulate a simple printer queue system.
3. Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications

1. Use a stack to evaluate an infix expression and convert it to postfix.
2. Create a program to determine whether a given string is a palindrome or not.
3. Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Search Tree

1. Implement a BST using linked list.
2. Traversing of BST.

Exercise 9: Hashing

1. Implement a hash table with collision resolution techniques.
2. Write a program to implement a simple cache using hashing.

Textbooks:

1. *Data Structures and Algorithm Analysis in C*, Mark Allen Weiss, Pearson, 2nd Edition.
2. *Fundamentals of Data Structures in C*, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008.

Reference Books:

1. *Algorithms and Data Structures: The Basic Toolbox*, Kurt Mehlhorn and Peter Sanders.
2. *C Data Structures and Algorithms*, Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft.
3. *Problem Solving with Algorithms and Data Structures*, Brad Miller and David Ranum.
4. *Introduction to Algorithms*, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein.
5. *Algorithms in C, Parts 1–5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms*, Robert Sedgewick.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (AUTONOMOUS) :: ANANTHAPURAMU – 515002 (A.P) INDIA

B.TECH R23 CURRICULUM

B.Tech.–(ARTIFICIAL INTELLENCE & MACHINE LEARNING)

I Year B.Tech. AI&ML – II Semester

L	T	P	C
0	0	1	0.5

(23A25901) HEALTH AND WELLNESS , YOGAANDSPORTS

(Common to CIVIL, MECH, CHEM, AI&ML)

CourseObjectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes:

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

CO1: Understand the importance of yoga and sports for physical fitness and sound health.
CO2: Demonstrate an understanding of health-related fitness components.
CO3: Compare and contrast various activities that help enhance their health.
CO4: Assess current personal fitness levels.
CO5: Develop positive personality traits.

UNIT I

Concept of Health and Fitness:
Nutrition and balanced diet, basic concept of immunity, relationship between diet and fitness, globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

- Organizing health awareness programmes in the community
- Preparation of health profile
- Preparation of chart for balanced diet for all age groups

UNIT II

Concept of Yoga:
Need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, physiological effects of asanas, pranayama and meditation, stress management and yoga, mental health and yoga practice.

Activities:

- Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and Fitness:
Importance, fitness components, history of sports, Ancient and Modern Olympics, Asian Games and Commonwealth Games.

Activities:

- Participation in one major game and one individual sport, viz., Athletics, Volleyball

Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warmup, aerobics Practicing cardiorespiratory fitness, treadmill, run test, 9minwalk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. HealthandWellness,14thEdn. Jones&BartlettLearning,2022
2. T.K.V. Desikachar. The Heart of Yoga: Developing a Personal Practice
3. ArchieJ.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rded.HumanKinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor/ yoga teacher to mentor the students.

Evaluation Guidelines:

1. Evaluated for a total of 100 marks.
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
3. A student shall be evaluated by the concerned teacher for10 marks by conducting viva voce on the subject.

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B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)
II Year B. Tech .AI&ML–I Semester

L	T	P	C
3	0	0	3

(23A35105) DISCRETE MATHEMATICS &GRAPHTHEORY

(Common to CSE and AI&ML)

Course Outcomes: After successful completion of this course, the students should be able to:

COs	Statements	Blooms level
CO1	Apply mathematical logic to solve problems.	L2, L3
CO2	Understand the concepts and perform the operations related to sets, relations and functions. Gain the conceptual background needed and identify structures of Algebraic nature.	L3, L5
CO3	Apply basic counting techniques to solve combinatorial problems.	L3
CO4	Formulate problems and solve recurrence relations.	L2, L3
CO5	Apply Graph Theory in solving computer science problems	L3, L5

UNIT I – Mathematical Logic
Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference Theory of Predicate Calculus.

UNIT II – Set Theory
The Principle of Inclusion-Exclusion, Pigeonhole principle and its application, Functions, Composition of functions, Inverse functions, Recursive functions, Lattices and its properties, Algebraic structures: Algebraic systems – Examples and General Properties, Semigroups and Monoids, Groups, Subgroups, Homomorphism, Isomorphism**.**

UNIT III – Elementary Combinatorics
Combinations and Permutations, Enumeration of combinations and permutations, Enumerating combinations and permutations with repetitions, Enumerating permutations with constrained repetitions, Binomial coefficients, The Binomial and Multinomial Theorems**.**

UNIT IV – Recurrence Relations
Generating functions of sequences, calculating coefficients of generating functions, Recurrence relations, solving recurrence relations by substitution and generating functions, The method of characteristic roots, Solutions of inhomogeneous recurrence relations**.**

UNIT V – Graphs
Basic concepts, Isomorphism and subgraphs, Trees and their properties, Spanning trees, Directed trees, Binary trees, Planar graphs, Euler's formula, Multigraphs and Euler circuits, Hamiltonian graphs.

Textbooks:

1. J. P. Tremblay and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill, 2002.
2. Kenneth H. Rosen, *Discrete Mathematics and its Applications with Combinatorics and Graph Theory*, 7th Edition, McGraw Hill Education (India) Private Limited.

Reference Books:

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, *Discrete Mathematics for Computer Scientists & Mathematicians*, 2nd Edition, Pearson Education.
2. Narsingh Deo, *Graph Theory with Applications to Engineering and Computer Science.*
3. Online Learning Resources:
   http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

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B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

II YearB.Tech.AI &ML–ISemester

L	T	P	C
2	1	0	3

(23A39901) UNIVERSAL HUMAN VALUES– UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

(Common to CIVIL, MECH, CHEM, AI&ML)

Course Objectives:

• To help the students appreciate the essential complementarity between **Values** and **Skills** to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

• To facilitate the development of a holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the human reality and the rest of existence; such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.

• To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour, and mutually enriching interaction with Nature.

COURSE OUTCOMES: At the end of the course, students will be able to		**Blooms Level**
CO1	Define the terms like Natural Acceptance, Happiness and Prosperity	L1, L2
CO2	Identify one's self, andone's surroundings (family, society nature)	L1, L2
CO3	Apply what they have learnt to their own self in different day-to-day settings in real life	L3
CO4	Relate human values with human relationship and human society.	L4
CO5	Justify the need for universal human values and harmonious existence	L5
CO6	Develop as socially and ecologically responsible engineers	L3, L6

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of1 – hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions. The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I – Introduction to Value Education (6 lectures + 3 tutorials)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: PS1 – Sharing about Oneself

Lecture 3: Self-exploration as the Process for Value Education

Lecture 4: Continuous Happiness and Prosperity – The Basic Human Aspirations

Tutorial 2: PS2 – Exploring Human Consciousness

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfil the Basic Human Aspirations

Tutorial 3: PS3 – Exploring Natural Acceptance

UNIT II – Harmony in the Human Being (6 lectures + 3 tutorials)
Lecture 7: Understanding Human Being as the Co-existence of the Self and the Body
Lecture 8: Distinguishing between the Needs of the Self and the Body
Tutorial 4: PS4 – Exploring the Difference of Needs of Self and Body
Lecture 9: The Body as an Instrument of the Self
Lecture 10: Understanding Harmony in the Self
Tutorial 5: PS5 – Exploring Sources of Imagination in the Self
Lecture 11: Harmony of the Self with the Body
Lecture 12: Programme to Ensure Self-regulation and Health
Tutorial 6: PS6 – Exploring Harmony of Self with the Body

UNIT III – Harmony in the Family and Society (6 lectures + 3 tutorials)
Lecture 13: Harmony in the Family – The Basic Unit of Human Interaction
Lecture 14: 'Trust' – The Foundational Value in Relationship
Tutorial 7: PS7 – Exploring the Feeling of Trust
Lecture 15: 'Respect' – As the Right Evaluation
Tutorial 8: PS8 – Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: PS9 – Exploring Systems to Fulfil Human Goal

UNIT IV – Harmony in Nature / Existence (4 lectures + 2 tutorials)
Lecture 19: Understanding Harmony in Nature
Lecture 20: Interconnectedness, Self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: PS10 – Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: PS11 – Exploring Co-existence in Existence

UNIT V – Implications of the Holistic Understanding – A Look at Professional Ethics (6 lectures + 3 tutorials)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: PS12 – Exploring Ethical Human Conduct
Lecture 25: Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: PS13 – Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models – Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: PS14 – Exploring Steps of Transition towards Universal Human Order

Practice Sessions (Tutorials):
UNIT I – Introduction to Value Education
PS1 – Sharing about Oneself
PS2 – Exploring Human Consciousness
PS3 – Exploring Natural Acceptance
UNIT II – Harmony in the Human Being
PS4 – Exploring Needs of Self and Body
PS5 – Exploring Sources of Imagination
PS6 – Exploring Harmony of Self with Body
UNIT III – Family & Society
PS7 – Exploring the Feeling of Trust
PS8 – Exploring the Feeling of Respect
PS9 – Exploring Systems to Fulfil Human Goal
UNIT IV – Nature / Existence
PS10 – Exploring the Four Orders of Nature
PS11 – Exploring Co-existence in Existence
UNIT V – Professional Ethics
PS12 – Exploring Ethical Human Conduct
PS13 – Exploring Humanistic Models in Education
PS14 – Exploring Steps of Transition towards Universal Human Order

READINGS:
Textbook & Teacher's Manual

1. R. R. Gaur, R. Asthana, G. P. Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN: 978-93-87034-47-1
2. R. R. Gaur, R. Asthana, G. P. Bagaria, *Teacher's Manual for A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN: 978-93-87034-53-2

Reference Books

1. *Jeevan Vidya: Ek Parichaya*, A. Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. *Human Values*, A. N. Tripathi, New Age International Publishers, New Delhi, 2004.
3. *The Story of Stuff* (Book).
4. *The Story of My Experiments with Truth* – M. K. Gandhi
5. *Small is Beautiful* – E. F. Schumacher
6. *Slow is Beautiful* – Cecile Andrews
7. *Economy of Permanence* – J. C. Kumarappa
8. *Bharat Mein Angreji Raj* – Pandit Sunderlal
9. *Rediscovering India* – Dharampal
10. *Hind Swaraj or Indian Home Rule* – M. K. Gandhi
11. *India Wins Freedom* – Maulana Abdul Kalam Azad
12. *Vivekananda* – Romain Rolland
13. *Gandhi* – Romain Rolland

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B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analysing and discussing the topic, the faculty mentor's role is to point to essential elements to help in sorting them out from the surface elements; in other words, to help students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and perform self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and the faculty mentor in a group sitting.

Tutorials (experiments or practicals) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included.

The practice sessions (tutorials) also provide support to a student in performing actions commensurate to his/her beliefs. This is intended to lead to the development of commitment—namely, behaving and working based on basic human values.

It is recommended that this content be placed before the student *as it is*, in the form of a basic foundation course, without adding or removing any part of the content. Additional content may be offered in separate, higher-level courses.

This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program (FDP) on Universal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
9. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

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COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTHAPURAMU–515002 (A.P) INDIA

B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

II Year B. Tech. AI & ML– I Semester

L	T	P	C
3	0	0	3

(23A33901) ARTIFICIAL INTELLIGENCE

Pre-requisite:
Knowledge in Computer Programming. A course on Mathematical Foundations of Computer Science. Background in linear algebra, data structures and algorithms, and probability.

Course Objectives:
- The students should be made to study the concepts of Artificial Intelligence.
- The students should be made to learn the methods of solving problems using Artificial Intelligence.
- The students should be made to introduce the concepts of Expert Systems.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.
- To learn different knowledge representation techniques.

UNIT I
Introduction: AI problems, foundation of AI and history of AI.
Intelligent agents: Agents and environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT II
Searching: Searching for solutions**.**
Uninformed search strategies: Breadth-First Search (BFS), Depth-First Search (DFS).
Search with partial information (Heuristic search): Hill Climbing, A*, AO* Algorithms.
Problem reduction.
Game Playing – Adversarial search: Games, Mini-Max algorithm, optimal decisions in multiplayer games, problems in game playing, Alpha-Beta pruning, evaluation functions.

UNIT III
Representation of Knowledge: Knowledge representation issues.
Predicate logic: Logic programming**.**
Semantic nets: Frames and inheritance, Constraint propagation.
Knowledge representation using rules: Rule-based deduction systems**.**
Reasoning under uncertainty: Review of probability, Bayes' probabilistic inferences, Dempster–Shafer theory**.**

UNIT IV
Logic Concepts: First-order logic.
Inference in first-order logic: Propositional vs. first-order inference, unification, lifted inference. Forward chaining, backward chaining, resolution.
Learning from observation: Inductive learning, decision trees, explanation-based learning, statistical learning methods, reinforcement learning.

UNIT V
Expert Systems: Architecture of expert systems, roles of expert systems, knowledge acquisition, meta-knowledge, heuristics.
Typical expert systems: MYCIN, DART, XCON**.** Expert system shells.

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B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

Textbooks:

1. S. Russell and P. Norvig, *Artificial Intelligence – A Modern Approach*, Second Edition, Pearson Education.
2. Kevin Knight and Elaine Rich, Nair B., *Artificial Intelligence (SIE)*, McGraw Hill.

Reference Books:

1. David Poole, Alan Mackworth, Randy Goebel, *Computational Intelligence: A Logical Approach*, Oxford University Press.
2. G. Luger, *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*, Fourth Edition, Pearson Education.
3. J. Nilsson, *Artificial Intelligence: A New Synthesis*, Elsevier Publishers.
4. Saroj Kaushik, *Artificial Intelligence*, CENGAGE Learning.

Online Learning Resources:

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

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B.Tech – R23 CURRICULUM

L	T	P	C
3	0	0	3

(23A30504) ADVANCED DATASTRUCTURES & ALGORITHM ANALYSIS

(Common to CSE,AI&ML)

Course Objectives: The main objectives of the course is to provide knowledge on advance datastructures frequently used in Computer Science domain Develop skills in algorithm design techniques popularly used Understand the use of various data structures in the algorithm design

Course Outcomes: After completion of the course, students will be able to
CO1: Illustrate the working of the advanced tree datastructures and their applications (L2)
CO2: Understand the Graph data structure , traversals and apply them in various contexts. (L2)
CO3: Use various datastructures in the design of algorithms (L3)
CO4: Recommend appropriate datastructures based on the problem being solved (L5)
CO5: Analyze algorithms with respect to space and time complexities (L4)
CO6: Design new algorithms (L6)

UNIT–I:
Introduction to AlgorithmAnalysis,Space and Time Complexity analysis, Asymptotic Notations.
AVLTrees– Creation, Insertion, Deletion operations and Applications.
B-Trees–Creation,Insertion,Deletion operations and Applications

UNIT–II:
Heap Trees(PriorityQueues)–Min and Max Heaps, Operations and Applications Graphs– Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications.
Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT–III:
Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths
Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights(BellmanFordAlgorithm), Optimal Binary SearchTrees,
0/1 Knapsack, String Editing,Travelling Salesperson problem

UNIT–IV:

Backtracking: GeneralMethod,8-Queens Problem, Sum of Sub sets problem, Graph Coloring, 0/1 Knapsack Problem

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Sales person problem.

UNIT–V:

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem,
Traveling Salesperson Decision Problem (TSP)
NP Hard Scheduling Problems:Scheduling Identical Processors, Job Shop Scheduling

Textbooks:

- Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni,
- Sartaj Mehta, Dinesh 2nd Edition Universities Press
- Computer Algorithms /C++ Ellis Horowitz, SartajSahni,
- Sanguthevar Rajasekaran 2nd Edition University Press

ReferenceBooks:

- Data Structures and program design in C, Robert Kruse, Pearson Education Asia
- An introduction to Data Structures with applications, Trembley & Sorenson, McGrawHill
- The Art of Computer Programming, Vol.1:Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
- Data Structures using C & C++ : Langsam, Augenstein & Tanenbaum, Pearson, 1995
- Algorithms + Data Structures & Programs : N.Wirth, PHI
- Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta,Galgottia Pub.
- Data structures in Java:, Thomas Standish, Pearson Education Asia

OnlineLearning Resources:

- https://www.tutorialspoint.com/advanced_data_structures/index.asp
- http://peterindia.net/Algorithms.html
- AbdulBari,1.IntroductiontoAlgorithms(youtube.com)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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B.Tech – R23 CURRICULUM

II Year B.Tech. AI&ML – I Semester

L	T	P	C
3	0	0	3

(23A30505) OBJECT-ORIENTED PROGRAMMING THROUGH JAVA

(Common to CSE, AI&ML)

Course Objectives

The learning objectives of this course are to:

Identify Java language components and understand how they work together in applications.
Learn the fundamentals of object-oriented programming (OOP) in Java, including defining classes, invoking methods, and using class libraries.
Extend Java classes using inheritance and dynamic binding, and learn how to implement exception handling in Java applications.
Understand how to design applications using threads in Java.

Course Outcomes

After completion of the course, students will be able to:
CO1: Analyze problems, design solutions using OOP principles, and implement them efficiently in Java. (L4)
CO2: Design and implement classes to model real-world entities, focusing on attributes, behaviors, and relationships between objects. (L4)
CO3: Demonstrate an understanding of inheritance hierarchies and polymorphic behavior, including method overriding and dynamic method dispatch. (L3)
CO4: Apply competence in handling exceptions and errors to write robust and fault-tolerant code. (L3)
CO5: Perform file input/output operations, including reading from and writing to files using Java I/O classes, and develop graphical user interface (GUI) programs using JavaFX. (L3)
CO6: Choose appropriate Java data structures to solve a given problem. (L6)

UNIT I

Object Oriented Programming: Basic concepts, Principles.
Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences, Comments, Programming Style**.**
Data Types, Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable, Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, final Attribute, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic

Operators, Increment (++) and Decrement (--) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator ?:, switch Statement, Iteration Statements: while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement**.**

UNIT II:

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes final and static.

UNIT III: Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class – Object Class, Inhibiting Inheritance of Class Using final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations**.**

UNIT IV:

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and ClassPath, Access Control, Packages in Java SE, java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, java.util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, TemporalAdjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, Standard I/O Streams, Types, Byte Streams, Character Streams, Scanner Class, Files in Java (Text Book 2).

UNIT V:

String Handling in Java: Introduction, Interface CharSequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class StringBuffer.

Multithreaded Programming: Introduction, Need for Multiple Threads, Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread, Creation of New Threads, Thread States, Thread Priority, Synchronization, Deadlock and Race Situations, Inter-thread Communication, Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface.

JavaFX GUI: JavaFX Scene Builder, JavaFX App Window Structure, Displaying Text and Images, Event Handling, Laying Out Nodes in Scene Graph, Mouse Events (Text Book 3).

Textbooks:

- JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
- Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
- JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

References Books:

- The complete Reference Java, 11th edition, Herbert Schildt, TMH
- Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Resources:

- https://nptel.ac.in/courses/106/105/106105191/
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881634 7_shared/overview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU – 515002 (A.P), INDIA
B.Tech – R23 CURRICULUM

II Year B.Tech. AI&ML – I Semester

L	T	P	C
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(23A30506)ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB

(Common to CSE, AI&ML)

data structures and to apply popular algorithm design methods in problem-solving scenarios.

Course Outcomes

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

CO1: Design and develop programs to solve real-world problems using popular algorithm design methods. (L5)

CO2: Demonstrate an understanding of non-linear data structures by developing and implementing operations on AVL Trees, B-Trees, Heaps, and Graphs. (L2)

CO3: Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications. (L5)

CO4: Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems. (L3)

CO5: Compare the performance of different algorithm design strategies. (L4)

CO6: Design algorithms for new real-world problems. (L6)

Experiments Covering the Topics

- Operations on AVL Trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting Techniques
- Minimum Cost Spanning Trees
- Shortest Path Algorithms
- 0/1 Knapsack Problem
- Travelling Salesperson Problem
- Optimal Binary Search Trees
- N-Queens Problem
- Job Sequencing

Sample Programs

- Construct an AVL tree for a given set of elements stored in a file and implement insert and delete operations. Write the contents of the tree into a new file using in-order traversal.
- Construct a B-Tree of order 5 with a set of 100 random elements stored in an array. Implement searching, insertion, and deletion operations.
- Construct Min and Max Heaps using arrays, delete any element, and display the heap contents.
- Implement BFT and DFT for a given graph represented by
- a) Adjacency Matrix

- b) Adjacency Lists
- Write a program to find the bi-connected components in a given graph.
- Implement Quicksort and Mergesort and observe execution time for various input sizes (Average, Worst, Best cases).
- Compare the performance of Single Source Shortest Path algorithms using a greedy method for graph representations via adjacency matrices and adjacency lists.
- Implement Job Sequencing with deadlines using a Greedy strategy.
- Solve the 0/1 Knapsack problem using Dynamic Programming.
- Implement the N-Queens Problem using Backtracking.
- Use Backtracking strategy to solve the 0/1 Knapsack problem.
- Implement the Travelling Salesperson Problem using Branch and Bound approach.

Reference Books

- Fundamentals of Data Structures in C++ — Horowitz Ellis, Sahni Sartaj, Mehta Dinesh, 2nd Edition, Universities Press
- Computer Algorithms / C++ — Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, 2nd Edition, University Press
- Data Structures and Program Design in C — Robert Kruse, Pearson Education Asia
- An Introduction to Data Structures with Applications — Trembley & Sorenson, McGraw-Hill

Online Learning Resources

- http://cse01-iiith.vlabs.ac.in/
- http://peterindia.net/Algorithms.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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B.Tech – R23 CURRICULUM
II Year B.Tech. AI&ML – I Semester

L	T	P	C
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(23A30507) OBJECT-ORIENTED PROGRAMMING THROUGH JAVA LAB

(Common to CSE, AI&ML)

Course Objectives

The aim of this course is to:

- Practice object-oriented programming in the Java programming language: implement Classes, Objects, Methods, Inheritance, Exception handling, Runtime Polymorphism, and User-defined Exception handling mechanisms.
- Illustrate Inheritance, Exception handling mechanisms, and JDBC connectivity.
- Construct Threads, handle Events, implement Packages, and develop JavaFX GUI applications.

Course Outcomes

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

CO1: Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling. (L2)

CO2: Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively. (L3)

CO3: Be familiar with commonly used Java libraries and APIs, including the Collections Framework, Java I/O, JDBC, and other utility classes. (L2)

CO4: Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges. (L3)

CO5: Proficiently construct graphical user interface (GUI) applications using JavaFX. (L4)

CO6: Develop new programs for solving typical computer science problems. (L6)

Experiments Covering the Topics

- Object-Oriented Programming fundamentals: data types, control structures
- Classes, Methods, Objects, Inheritance, Polymorphism
- Exception handling, Threads, Packages, Interfaces
- Files, I/O Streams, JavaFX GUI

Sample Experiments

Exercise 1

- Write a Java program to display default values of all primitive data types.
- Write a Java program to display the roots of a quadratic equation ax^2+bx=0.
- Calculate the discriminant D and describe the nature of the roots based on D.

Exercise 2

- Write a Java program to search for an element in a list using binary search.
- Write a Java program to sort elements in a list using bubble sort.
- Write a Java program using StringBuffer to delete/remove characters.

Exercise 3

- Implement class mechanism: create a class, define methods, and invoke them in the main method.
- Implement method overloading.
- Implement constructors and constructor overloading.

Exercise 4

- Implement single inheritance.
- Implement multilevel inheritance.
- Implement an abstract class to find areas of different shapes.

Exercise 5

- Demonstrate the use of the super keyword.
- Implement an Interface and explain the type of inheritance achieved.
- Implement runtime polymorphism.

Exercise 6

- Implement exception handling mechanisms.
- Illustrate multiple catch clauses.
- Create Java built-in exceptions.
- Create user-defined exceptions.

Exercise 7

- Create threads by extending Thread class and implementing Runnable.
- First thread displays “Good Morning” every 1 sec.
- Second thread displays “Hello” every 2 sec.
- Third thread displays “Welcome” every 3 sec.
- Illustrate isAlive() and join().
- Demonstrate daemon threads.
- Implement the Producer-Consumer Problem.

Exercise 8

- Import and use user-defined packages.
- Build a GUI that displays text in a label and an image in an ImageView (JavaFX).
- Build a Tip Calculator app using various JavaFX components and handle user interactions.

Exercise 9

- Connect to a database using JDBC.
- Connect to a database and insert values using JDBC.
- Connect to a database and delete values using JDBC.

Textbooks

- Java One Step Ahead, Anitha Seth, B.L. Juneja, Oxford
- Joy with Java: Fundamentals of Object-Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023
- Java 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson

Reference Books

- The Complete Reference Java, 11th Edition, Herbert Schildt, TMH
- Introduction to Java Programming, 7th Edition, Y. Daniel Liang, Pearson

Online Resources:

- https://nptel.ac.in/courses/106/105/106105191/
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816 HYPERLINK "https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview"347_shared/o HYPERLINK "https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview"v erview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU – 515002 (A.P), INDIA
B.Tech – R23 CURRICULUM

II Year B.Tech. AI&ML – I Semester

L	T	P	C
0	1	2	2

(23A30502) PYTHON PROGRAMMING (SKILL ENHANCEMENT COURSE)
(Common to CSE, AI&ML)

Course Objectives

The main objectives of the course are to:

- Introduce core programming concepts of the Python programming language.
- Demonstrate Python data structures such as Lists, Tuples, Sets, and Dictionaries.
- Implement Functions, Modules, and Regular Expressions in Python programming and create practical and contemporary applications using these concepts.

Course Outcomes

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

CO1: Classify data structures of Python. (L4)
CO2: Apply Python programming concepts to solve a variety of computational problems. (L3)
CO3: Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs. (L3)
CO4: Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, and pandas. (L2)
CO5: Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, and dictionaries. (L3)
CO6: Propose new solutions to computational problems. (L6)

Unit-I:

Introduction to Python

- History of Python Programming Language
- Thrust Areas of Python

- Installing Anaconda Python Distribution
- Installing and Using Jupyter Notebook

Parts of Python Programming Language:

- Identifiers, Keywords, Statements, and Expressions
- Variables, Operators, Precedence and Associativity
- Data Types, Indentation, Comments
- Reading Input, Printing Output
- Type Conversions, type() Function, and is Operator
- Dynamic and Strongly Typed Language

Control Flow Statements:

- if statement, if-else statement, if-elif-else, Nested if statement
- while loop, for loop
- continue and break statements
- Catching Exceptions using try and except statements

Sample Experiments – Unit I

- Write a program to find the largest element among three numbers.
- Write a program to display all prime numbers within an interval.
- Write a program to swap two numbers without using a temporary variable.
- Demonstrate the following operators in Python with suitable examples:
  1.Arithmetic Operators
  2.Relational Operators
  3.Assignment Operators
  4.Logical Operators
  5.Bitwise Operators
  6.Ternary Operator
  7.Membership Operators
  8.Identity Operators
- Write a program to add and multiply complex numbers.
- Write a program to print the multiplication table of a given number.

Unit-II: Functions in Python

- Built-in Functions
- Commonly Used Modules
- Function Definition and Calling Functions
- return Statement and Void Functions
- Scope and Lifetime of Variables
- Default Parameters and Keyword Arguments
- *args and **kwargs
- Command Line Arguments

Strings:
Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.
Lists:
Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-in Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the following operations on a list:
    i. Addition ii. Insertion iii. Slicing
12. Write a program to perform any 5 built-in functions by taking any list.

UNIT III – Dictionaries, Tuples and Sets
Dictionaries:
Creating Dictionary, Accessing and Modifying Key: Value Pairs in Dictionaries, Built-in Functions Used on Dictionaries, Dictionary Methods, del Statement.
Tuples and Sets:
Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-in Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozen set.

Sample Experiments:

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuple.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key–value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

UNIT IV – Files and OOP in Python
Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.
Object-Oriented Programming:
Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

18. Write a program to sort words in a file and put them in another file. Output file must have all lowercase words.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of items in an array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape; include methods to calculate area and perimeter. Implement subclasses for circle, triangle, and square.

UNIT V – Introduction to Data Science

Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

24. Python program to check whether a JSON string contains a complex object or not.
25. Python program to demonstrate NumPy arrays creation using array() function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array.
29. Create a dictionary with at least five keys; each key contains a list of at least ten values. Convert this dictionary to a Pandas DataFrame and explore the data.
30. Apply head() function to the Pandas DataFrame.
31. Perform various data selection operations on DataFrame.
32. Select any two columns from the DataFrame and observe the relation between attributes using scatter and plot in Matplotlib.

Reference Books:

1. Gowri Shankar S., Veena A., *Introduction to Python Programming*, CRC Press.
2. *Python Programming*, S. Sridhar, J. Indumathi, V. M. Hariharan, 2nd Edition, Pearson, 2024.
3. Y. Daniel Liang, *Introduction to Programming Using Python*, Pearson.

Online Learning Resources / Virtual Labs:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU–515002 (A.P) INDIA

B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

II Year B. Tech. AI & ML– I Semester

L	T	P	C
2	0	0	0

(23A39902) ENVIRONMENTAL SCIENCE
(Common to All Branches)

Course Objectives:

a. To make the students to get awareness on environment.
b. To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
c. To save earth from the inventions by the engineers.

UNIT I

Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.
Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems.
Forest resources: Use and over-exploitation, deforestation, case studies – Timber extraction – Mining, dams and their effects on forests and tribal people.
Water resources: Use and over-utilization of surface and groundwater – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer–pesticide problems, waterlogging, salinity, case studies.
Energy resources: (Content continues in full syllabus as applicable.)

UNIT II

Ecosystems: Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids.

Types, characteristics, structure and function of the following ecosystems:

1. Forest ecosystem
2. Grassland ecosystem
3. Desert ecosystem
4. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation:
Introduction – Definition: genetic, species and ecosystem diversity – Biogeographical classification of India.
Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values.
Biodiversity at global, national and local levels – India as a mega-diversity nation – Hotspots of biodiversity.
Threats to biodiversity: Habitat loss, poaching of wildlife, man–wildlife conflicts.
Endangered and endemic species of India.
Conservation: In-situ and Ex-situ conservation of biodiversity.

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B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

UNIT III

Environmental Pollution: Definition, causes, effects and control measures of:

1. Air pollution
2. Water pollution
3. Soil pollution
4. Marine pollution
5. Noise pollution
6. Thermal pollution
7. Nuclear hazards

Solid Waste Management:
Causes, effects and control measures of urban and industrial wastes.
Role of an individual in prevention of pollution**.**
Pollution case studies.
Disaster Management: Floods, earthquakes, cyclones and landslides.

UNIT IV – Social Issues and the Environment

From unsustainable to sustainable development – Urban problems related to energy – Water conservation, rainwater harvesting, watershed management – Resettlement and rehabilitation of people: problems and concerns; case studies.
Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust; case studies.
Wasteland reclamation – Consumerism and waste products.
Environmental Protection Laws: Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act.
Issues involved in enforcement of environmental legislation – Public awareness.

UNIT V – Human Population and the Environment

Population growth, variation among nations – Population explosion – Family welfare programmes.
Environment and human health – Human rights – Value education – HIV/AIDS – Women and child welfare.
Role of Information Technology in environment and human health – Case studies.
Field Work: Visit to a local area to document environmental assets: river/forest/grassland/hill/mountain – Visit to a local polluted site (Urban/Rural/Industrial/Agricultural) – Study of common plants, insects, and birds – Study of river, hill slopes, etc.

Textbooks:

1. *Textbook of Environmental Studies for Undergraduate Courses*, Erach Bharucha, University Grants Commission, Universities Press.
2. Palaniswamy, *Environmental Studies*, Pearson Education.
3. S. Azeem Unnisa, *Environmental Studies*, Academic Publishing Company.
4. K. Raghavan Nambiar, *Textbook of Environmental Studies for Undergraduate Courses as per UGC Model Syllabus*, Scitech Publications (India) Pvt. Ltd.

References:

1. Deeksha Dave and E. Sai Baba Reddy, *Textbook of Environmental Science*, Cengage Publications.
2. M. Anji Reddy, *Textbook of Environmental Sciences and Technology*, BS Publications.
3. J. P. Sharma, *Comprehensive Environmental Studies*, Laxmi Publications.
4. J. Glynn Henry and Gary W. Heinke, *Environmental Sciences and Engineering*, Prentice Hall of India Pvt. Ltd.
5. G. R. Chatwal, *A Textbook of Environmental Studies*, Himalaya Publishing House.
6. Gilbert M. Masters and Wendell P. Ela, *Introduction to Environmental Engineering and Science*, Prentice Hall of India Pvt. Ltd.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

II Year B. Tech. AI & ML– I Semester

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(23A43901) OPTIMIZATION TECHNIQUES

Course Outcomes:

COs	Statements	Blooms Level
CO1	Understanding Optimization and Formulation of Linear Programing Models	L1
CO2	Formulate and Solve Transportation & Assignment Models	L3
CO3	Sequencing of operations and optimizing	L2
CO4	Discuss the game theory and strategies	L2
CO5	Developing networks of activities and finding optimal mode of projects evaluation.	L3

Course Objectives: The objectives of the course are to:
• Provide basic knowledge about Optimization, its importance, application areas in industry, and Linear Programming.
• Impart different optimization models under typical business situations such as transportation and assignment models.
• Understand the process of sequencing in a typical industry.
• Describe different game strategies under a competitive business environment.
• Develop networks of project activities and determine optimal modes of project completion using network modelling and evaluation techniques.

UNIT I

Introduction: Meaning, Nature, Scope & Significance of Optimization – Typical applications.
Linear Programming Problem: Introduction, Formulation of Linear Programming Problem, Limitations of LPP, Graphical method.
Simplex method: Maximization and minimization models (exclude duality problems), Big-M method, Two-phase method.

UNIT II

Transportation Problem: Introduction, Transportation model, Finding initial basic feasible solutions, Moving towards optimality, Unbalanced transportation problems, Transportation problems with maximization, Degeneracy.
Assignment Problem: Introduction, Mathematical formulation, Solution of assignment problem, Hungarian Algorithm, Multiple solutions, Unbalanced assignment problems, Maximization in assignment model.

UNIT III

Sequencing: Job sequencing, Johnson's Algorithm for n jobs and two machines, n jobs and three machines, n jobs through m machines, Two jobs and m machines problems.

UNIT IV

Game Theory: Concepts, Definitions and Terminology – Two-person zero-sum games – Pure strategy games (with saddle point) – Principle of dominance – Mixed strategy games (games without saddle point) – Significance of Game Theory in managerial applications.

UNIT V

Project Management: Network analysis – Definition, objectives – Rules for constructing network diagrams – Determining critical path – Earliest & latest times – Floats – Application of CPM and PERT techniques in project planning and control – PERT vs CPM (exclude project crashing).

Textbooks:

1. *Operations Research*, R. Pannerselvam, PHI Publications.
2. *Operations Research*, S. D. Sharma, Kedarnath.
3. *Operations Research*, A. M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education.
4. *Engineering Optimization: Theory and Practice*, S. S. Rao, New Age International (P) Limited.

Reference Books:

1. *Quantitative Techniques in Management*, N. D. Vohra, Tata McGraw Hill, 4th Edition, 2011.
2. *Introduction to Operations Research*, Hillier & Lieberman, TMH.
3. *Operations Research: Methods & Problems*, Maurice Sasieni, Arthur Yaspan & Lawrence Friedman, Pearson.
4. *Quantitative Analysis for Management*, Barry Render, Ralph M. Stair Jr., Michael E. Hanna.
5. *Operations Research*, Wagner, PHI Publications.

Online Learning Sources:

1. https://onlinecourses.swayam2.ac.in/cec20_ma10/preview
2. https://onlinecourses.nptel.ac.in/noc20_ma23/preview
3. https://onlinecourses.nptel.ac.in/noc19_ma29/preview

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B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

II Year B.Tech. AI & ML– I Semester

L	T	P	C
3	0	0	3

(23A45102) PROBABILITY & STATISTICS

(Common to CSE, AI & ML)

Course Outcomes: After successful completion of this course, the students should be able to:

COs	Statements	Blooms level
CO1	Acquire knowledge in finding the analysis of the data quantitatively or categorically and various statistical elementary tools.	L2, L3
CO2	Develop skills in designing mathematical models involving probability, Random variables and the critical thinking in the theory of probability and its applications in real life problems.	L3, L5
CO3	Apply the theoretical probability distributions like binomial, Poisson and Normal in the relevant application areas.	L3
CO4	Analyze to test various hypotheses included in theory and types of errors for large samples.	L2, L3
CO5	Apply the different testing tools liket- test, F-test, chi-square test to analyze the relevant real-life problems.	L3, L5

UNITI: Descriptive statistics

Statistics: Introduction – Population vs Sample – Collection of data: primary and secondary data – Measures of Central Tendency – Measures of Variability (spread or variance) – Skewness – Kurtosis – Correlation – Correlation coefficient – Rank correlation – Regression coefficients – Method of least squares – Regression lines.

UNITII: Probability

Probability – Probability axioms – Addition law and Multiplicative law of probability – Conditional probability – Bayes' theorem – Random variables (discrete and continuous) – Probability density functions – Properties – Mathematical expectation.

UNITIII: Probability distributions

Probability distributions: **Binomial, Poisson, and Normal** – Their properties (Chebyshev's inequality). Approximation of the binomial distribution to normal distribution.

UNIT IV – Estimation and Testing of Hypothesis (Large Sample Tests)

Estimation: Parameters, statistics, sampling distribution, point estimation.

Formulation of null hypothesis and alternative hypothesis – Critical and acceptance regions – Level of significance – Types of errors – Power of the test.

Large Sample Tests:

- Test for single proportion
- Test for difference of proportions
- Test for single mean
- Test for difference of means
- Confidence intervals for parameters in one-sample and two-sample problems.

UNIT V – Small Sample Tests

Student's t-distribution:

- Test for single mean
- Test for two means
- Paired t-test

1. Testing of equality of variances (**F-test**)
2. Chi-square (χ^2) test for goodness of fit
3. Chi-square (χ^2) test for independence of attributes

Textbooks:

1. Miller and Freund's, *Probability and Statistics for Engineers*, 7/e, Pearson, 2008.
2. S. C. Gupta and V. K. Kapoor, *Fundamentals of Mathematical Statistics*, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S. Ross, *A First Course in Probability*, Pearson Education India, 2002.
2. W. Feller, *An Introduction to Probability Theory and Its Applications*, 1/e, Wiley, 1968.
3. B. V. Ramana, *Higher Engineering Mathematics*, McGraw Hill Education.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU–515002 (A.P) INDIA

B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

II Year B. Tech. AI & ML– II Semester

L	T	P	C
3	0	0	3

(23A43902) MACHINE LEARNING

Course Objectives: The objectives of the course are:

• Define machine learning and its different types (supervised and unsupervised) and understand their applications.

• Apply supervised learning algorithms including decision trees and k-nearest neighbours (k-NN).

• Implement unsupervised learning techniques such as K-means clustering.

Course Outcomes:

CO1: Identify machine learning techniques suitable for a given problem. (L3)

CO2: Solve real-world problems using various machine learning techniques. (L3)

CO3: Apply dimensionality reduction techniques for data preprocessing. (L3)

CO4: Explain what learning is and why it is essential in the design of intelligent machines. (L2)

CO5: Evaluate advanced learning models for language, vision, speech, decision-making, etc. (L5)

UNIT I – Introduction to Machine Learning

Evolution of Machine Learning – Paradigms for ML – Learning by Rote – Learning by Induction – Reinforcement Learning – Types of Data – Matching – Stages in Machine Learning – Data Acquisition – Feature Engineering – Data Representation – Model Selection – Model Learning – Model Evaluation – Model Prediction – Search and Learning – Data Sets.

UNIT II – Nearest Neighbor-Based Models

Introduction to Proximity Measures – Distance Measures – Non-metric Similarity Functions – Proximity Between Binary Patterns – Classification Algorithms Based on Distance Measures – K-Nearest Neighbor Classifier – Radius Distance Nearest Neighbor Algorithm – KNN Regression – Performance of Classifiers – Performance of Regression Algorithms.

UNIT III – Decision Tree Models & Bayes Classifier

Decision Trees:

Decision Trees for Classification – Impurity Measures – Properties – Regression Based on Decision Trees – Bias–Variance Trade-off – Random Forests for Classification and Regression.

Bayes Classifier:

Introduction to the Bayes Classifier – Bayes' Rule and Inference – The Bayes Classifier and its Optimality – Multi-class Classification – Class Conditional Independence – Naive Bayes Classifier (NBC).

UNIT IV – Linear Discriminants & Neural Models

Introduction to Linear Discriminants – Linear Discriminants for Classification – Perceptron Classifier – Perceptron Learning Algorithm – Support Vector Machines (SVM) – Linearly Non-Separable Case – Non-linear SVM – Kernel Trick – Logistic Regression – Linear Regression – Multi-layer Perceptrons (MLPs) – Backpropagation for Training an MLP.

UNIT V – Clustering

Introduction to Clustering – Partitioning of Data – Matrix Factorization – Clustering of Patterns – Divisive Clustering – Agglomerative Clustering – Partitional Clustering – K-Means Clustering – Soft Partitioning – Soft Clustering – Fuzzy C-Means Clustering – Rough Clustering – Rough K-Means Algorithm – Expectation Maximization (EM) Based Clustering – Spectral Clustering.

Text Books:

1. "Machine Learning Theory and Practice", M N Murthy, V S Anantha narayana, Universities Press (India), 2024

Reference Books:

1. "Machine Learning", Tom M. Mitchell, Mc Graw- Hill Publication, 2017
2. "Machine Learning in Action", Peter Harrington, Dream Tech
3. "Introduction to Data Mining", Pang- Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

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3	0	0	3

(23A40502) DATABASE MANAGEMENT SYSTEMS

(Common to CSE, AI&ML)

Course Objectives: The main objectives of the course are to:
• Introduce database management systems and provide a formal foundation on the relational model of data and Relational Algebra.
• Introduce the concepts of basic SQL as a universal database language.
• Demonstrate systematic database design approaches, including conceptual and logical design through normalization.
• Provide an overview of physical database design by discussing database indexing techniques and storage techniques.

Course Outcomes: ***(After completion of the course, students will be able to)***
CO1: Understand the basic concepts of database management systems. (L2)
CO2: Analyse a given database application scenario using ER model for conceptual design. (L4)
CO3: Utilize SQL proficiently to address diverse query challenges. (L3)
CO4: Employ normalization methods to enhance database structure. (L3)
CO5: Assess and implement transaction processing, concurrency control, and database recovery protocols. (L4)

UNIT I – Introduction to Databases

Database system – Characteristics (Database vs File System) – Database users – Advantages of database systems – Database applications.
Overview of Data Models – Concepts of Schema, Instance, and Data Independence – Three-tier Schema Architecture – Database system structure and environment – Centralized and Client–Server architecture.

Entity Relationship (ER) Model:
Entities, Attributes, Entity Set – Relationships, Relationship Set – Constraints – Subclasses, Superclass – Inheritance – Specialization – Generalization – ER Diagrams.

UNIT II – Relational Model & Basic SQL

Relational Model: Domain, Attribute, Tuple, Relation – Null values – Domain, Key and Integrity Constraints – Relational Algebra – Relational Calculus.

Basic SQL:
Simple Database Schema – Data types – Table definitions (CREATE, ALTER) – DML operations (INSERT, DELETE, UPDATE).

UNIT III – SQL (Intermediate to Advanced)

Basic SQL querying: SELECT, WHERE clause, arithmetic & logical operations.
SQL Functions: Date & Time, Numeric, String conversion.
Creating tables with relationships – Key and integrity constraints – Nested queries, subqueries – Grouping, aggregation, ordering – Types of joins – Views (updatable and non-updatable) – Relational set operations.

UNIT IV – Schema Refinement (Normalization)

Purpose of normalization – Concept of functional dependency – Normal forms based on functional dependency – Lossless join and dependency preserving decomposition.
Normal Forms: 1NF, 2NF, 3NF, BCNF – Surrogate keys – MVD – 4NF – 5NF.

UNIT V – Transaction Management & Indexing

Transaction Concepts: Transaction states – ACID properties – Concurrent executions – Serializability – Recoverability – Isolation implementation – Testing for serializability – Lock-based, Timestamp-based, Optimistic concurrency protocols – Deadlocks – Failure classification – Storage, recovery and atomicity – Recovery algorithms.

Indexing Techniques: B+ Trees, operations on B+ Trees, Hash-based indexing.

Textbooks:

1. *Database Management Systems*, 3rd Edition, Raghurama Krishnan, Johannes Gehrke, TMH (Chapters 2, 3, 4).
2. *Database System Concepts*, 5th Edition, Silberschatz, Korth, Sudarshan, TMH (Chapter 1 and Chapter 5).

Reference Books:

1. *Introduction to Database Systems*, 8th Edition, C. J. Date, Pearson.
2. *Database Management Systems*, 6th Edition, Ramez Elmasri, Shamkant B. Navathe, Pearson.
3. *Database Principles: Fundamentals of Design, Implementation and Management*, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web Resources:

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

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II Year B. Tech. AI & ML– II Semester

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(23A43903) DIGITAL LOGIC & COMPUTER ORGANIZATION

Course Objectives: The main objectives of the course are to:

1. Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals.
2. Describe memory hierarchy concepts.
3. Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices.

Course Outcomes: ***(After completion of the course, students will be able to)***

CO1: Differentiate between combinational and sequential circuits based on their characteristics and functionalities. (L2)
CO2: Demonstrate an understanding of computer functional units. (L2)
CO3: Analyse the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms. (L3)
CO4: Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on performance. (L3)
CO5: Explain input/output (I/O) systems and their interaction with CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping. (L3)
CO6: Design sequential and combinational circuits. (L6)

UNIT I – Data Representation & Digital Logic Circuits I

Data Representation: Binary numbers, fixed-point representation, floating-point representation, number base conversions, octal and hexadecimal numbers, components, signed binary numbers, binary codes.
Digital Logic Circuits-I: Basic logic functions – Logic gates – Universal logic gates – Minimization of logic expressions – K-Map simplification – Combinational circuits – Decoders – Multiplexers.

UNIT II – Digital Logic Circuits II & Basic Computer Structure

Digital Logic Circuits-II: Sequential circuits – Flip-flops – Binary counters – Registers – Shift registers – Ripple counters.
Basic Structure of Computers: Computer types – Functional units – Basic operational concepts – Bus structures – Software – Performance – Multiprocessors and multicomputers – Computer generations – Von Neumann architecture.

UNIT III – Computer Arithmetic & Processor Organization

Computer Arithmetic: Addition and subtraction of signed numbers – Design of fast adders – Multiplication of positive numbers – Signed-operand multiplication – Fast multiplication – Integer division – Floating-point numbers and operations.
Processor Organization: Fundamental concepts – Execution of a complete instruction – Multiple-bus organization – Hardwired control and microprogrammed control.

UNIT IV – Memory Organization

Basic concepts – Semiconductor RAM memories – Read-only memories – Speed, size, and cost – Cache memories – Performance considerations – Virtual memories – Memory management requirements – Secondary storage.

UNIT V – Input/Output Organization

Accessing I/O devices – Interrupts – Processor examples – Direct Memory Access (DMA) – Buses – Interface circuits – Standard I/O interfaces.

Textbooks:

1. *Computer Organization*, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 6th Edition, McGraw Hill, 2023.
2. *Digital Design*, M. Morris Mano, 6th Edition, Pearson Education, 2018.
3. *Computer Organization and Architecture*, William Stallings, 11th Edition, Pearson, 2022.

Reference Books:

1. *Computer Systems Architecture*, M. Morris Mano, 3rd Edition, Pearson, 2017.
2. *Computer Organization and Design*, David A. Patterson, John L. Hennessy, Elsevier, 2004.
3. *Fundamentals of Logic Design*, Roth, 5th Edition, Thomson, 2003.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/103/106103068/

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B. TECH R23 CURRICULUM

B.Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)
II Year B. Tech. AI & ML– II Semester

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(23A43904) AI & ML Lab

Course Objectives:

The students should be made to study the concepts of Artificial Intelligence.

- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The students should be made to introduce the concepts of Expert Systems and Machine Learning.
- To learn about computing central tendency measures and data preprocessing techniques.
- To learn about classification and regression algorithms.
- To apply different clustering algorithms for a problem.

Course Outcomes: ***(After completion of the course, students will be able to)***

CO1: Understand the mathematical and statistical perspectives of machine learning algorithms through Python programming. (L2)
CO2: Appreciate the importance of visualization in data analytics solutions. (L5)
CO3: Derive insights using machine learning algorithms. (L2)
CO4: Evaluate and demonstrate AI and ML algorithms. (L5)
CO5: Evaluate different algorithms. (L5)

Software Required for ML:

Python / R / Weka

List of Experiments (Using Pandas & ML Algorithms):

Pandas Library

1. Write a Python program to implement Pandas Series with labels.
2. Create a Pandas Series from a dictionary.
3. Creating a Pandas DataFrame.
4. Write a program that uses the following Pandas methods:
   i) describe() ii) head() iii) tail() iv) info()
5. Pandas Library: Visualization
6. Write a program using Pandas built-in visualization to plot:
   i) Bar plots ii) Histograms iii) Line plots iv) Scatter plots

Search Algorithms

7. Write a program to implement Breadth First Search using Python.
8. Write a program to implement Best First Searching Algorithm.
9. Write a Program to implement Depth First Search using Python.
10. Write a program to implement Heuristic Search.
11. Write a Python program to implement A* and AO* algorithm (e.g., find the shortest path).

Preprocessing Techniques

12. Apply the following preprocessing techniques for a given dataset:
13. Attribute selection
14. Handling missing values
15. Discretization
16. Elimination of outliers

Machine Learning Algorithms

17. Apply KNN algorithm for classification and regression.
18. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results.
19. Apply Random Forest algorithm for classification and regression.
20. Demonstrate Naïve Bayes Classification algorithm.
21. Apply Support Vector Machine algorithm for classification.
22. Implement the K-means algorithm and apply it to a selected dataset. Evaluate performance by measuring the sum of Euclidean distances of each example from its class center. Test performance as a function of K.

Reference Books:

1. Stuart J. Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Fourth Edition, Pearson, 2020.
2. Martin C. Brown, *Python: The Complete Reference*, McGraw Hill Education, Fourth Edition, 2018.
3. R. Nageswara Rao, *Core Python Programming*, Dreamtech Press India Pvt. Ltd., 2018.
4. Tom M. Mitchell, *Machine Learning*, McGraw-Hill Publication, 2017.
5. Peter Harrington, *Machine Learning in Action*, DreamTech.
6. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, *Introduction to Data Mining*, Seventh Edition, 2019.

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0	0	3	1.5

(23A40505) DATABASE MANAGEMENT SYSTEMS LAB

(Common to CSE, AI & ML)

Course Objectives: This Course will enable students to

Populate and query a database using SQL DDL/DML commands.

- Declare and enforce integrity constraints on a database.
- Write queries using advanced SQL concepts.
- Program in PL/SQL including procedures, functions, cursors, and triggers.

Course Outcomes: ***(After completion of the course, students will be able to)***

CO1: Utilize Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment. (L3)

CO2: Construct and execute queries to manipulate and retrieve data from databases. (L3)

CO3: Develop application programs using PL/SQL. (L3)

CO4: Analyse requirements and design custom procedures, functions, cursors, and triggers to automate tasks and optimize database functionality. (L4)

CO5: Establish database connectivity through JDBC (Java Database Connectivity). (L3)

Experiments Covering the Topics:

- DDL, DML, DCL Commands
- Queries, nested queries, built-in functions
- PL/SQL programming – control structures
- Procedures, Functions, Cursors, Triggers
- Database connectivity – ODBC/JDBC

Sample Experiments:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables). Examples using SELECT command.
2. Queries (with subqueries) using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, Constraints.
   Example: Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using aggregate functions (COUNT, SUM, AVG, MAX, MIN), GROUP BY, HAVING, and creation and dropping of views.
4. Queries using conversion functions (TO_CHAR, TO_NUMBER, TO_DATE), string functions (concatenation, LPAD, RPAD, LTRIM, RTRIM, LOWER, UPPER, INITCAP, LENGTH, SUBSTR, INSTR), date functions (SYSDATE, NEXT_DAY, ADD_MONTHS, LAST_DAY, MONTHS_BETWEEN, LEAST, GREATEST, TRUNC, ROUND).
5. Create a simple PL/SQL program including declaration, executable, and exception-handling sections (e.g., print students who secured first class; raise an exception if no records found).
6. Insert data into student table and use COMMIT, ROLLBACK, and SAVEPOINT in a PL/SQL block.
7. Develop a program that includes NESTED IF, CASE, CASE expression, NULLIF, and COALESCE functions.
8. Program using WHILE loops, numeric FOR loops, nested loops with error handling, built-in exceptions, user-defined exceptions, and RAISE_APPLICATION_ERROR.

9. Develop programs to create procedures, pass parameters (IN and OUT).
10. Develop programs using stored functions, invoke functions in SQL statements, and write complex functions.
11. Programs using parameters in a cursor, FOR UPDATE cursor, WHERE CURRENT OF clause, and cursor variables.
12. Develop programs using BEFORE and AFTER triggers, row and statement triggers, INSTEAD OF triggers.
13. Create a table and perform search operations using indexing and non-indexing techniques.
14. Write a Java program that connects to a database using JDBC.
15. Write a Java program to connect to a database using JDBC and insert values into it.
16. Write a Java program to connect to a database using JDBC and delete values from it.

Textbooks / Suggested Reading:

1. *Oracle: The Complete Reference*, Oracle Press.
2. Nilesh Shah, *Database Systems Using Oracle*, PHI, 2007.
3. Rick F. Vander Lans, *Introduction to SQL*, Fourth Edition, Pearson Education, 2007.

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II Year B.Tech. AI & ML– II Semester

L	T	P	C
0	1	2	2

(23A40506) FULL STACK DEVELOPMENT–1

(Skill Enhancement Course)

(Common to CSE, AI&ML)

Course Objectives: The main objectives of the course are to:
- Make use of HTML elements and their attributes for designing static web pages.
- Build a webpage by applying appropriate CSS styles to HTML elements.
- Experiment with JavaScript to develop dynamic web pages and validate forms.

Course Outcomes: ***(After completion of the course, students will be able to)***
CO1: Design websites. (L6)
CO2: Apply styling to webpages. (L4)
CO3: Make webpages interactive. (L6)
CO4: Design forms for applications. (L6)
CO5: Choose control structures based on the logic to be implemented. (L3)
CO6: Understand HTML tags, attributes, and CSS properties. (L2)

Experiments Covering the Topics:
- Lists, Links, and Images
- HTML Tables, Forms, and Frames
- HTML5 and Cascading Style Sheets (CSS), Types of CSS
- Selector forms
- CSS with Color, Background, Font, Text, and CSS Box Model
- Applying JavaScript (internal and external), I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events
- Node.js

Sample Experiments:

Lists, Links, and Images

1. Write an HTML program to explain the working of lists.
2. The program should contain an ordered list, unordered list, nested lists, and an ordered list inside an unordered list, and definition lists.
3. Write an HTML program to explain the working of hyperlinks using <a> tag with href and target attributes.
4. Create an HTML document that displays your image and your friend's image with specific height and width. Clicking on each image should navigate to respective profiles.
5. Write an HTML program demonstrating the use of thumbnail images (e.g., 100×100 px). Each thumbnail should be linked to a full-sized version. Create an image gallery using this technique.

HTML Tables, Forms, and Frames

6. Write an HTML program to explain the working of tables using tags <table>, <tr>, <th>, <td> and attributes such as border, rowspan, and colspan.

8. Write a HTML program, to explain the working of tables by preparing a timetable.
   (Note: Use `<caption>` tag to set the caption to the table & also use cellspacing, cellpadding, border, rowspan, colspan etc.).
9. Write a HTML program, to explain the working of forms by designing Registration form.
   (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using `<select>` & `<option>` tags, `<textarea>` and two buttons i.e: submit and reset. Use tables to provide a better view).
10. Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction.
    (Note: first frame image, second frame paragraph, third frame hyperlink. And also make sure of using "no frame" attribute such that frames to be fixed).
11. HTML5 and Cascading Style Sheets, Types of CSS
12. Write a HTML program, that makes use of `<article>`, `<aside>`, `<figure>`, `<figcaption>`, `<footer>`, `<header>`, `<main>`, `<nav>`, `<section>`, `<div>`, `<span>` tags.
13. Write a HTML program, to embed audio and video into HTML webpage.
14. Write a program to apply different types (or levels of styles or style specification formats)
    - inline, internal, external styles to HTML elements.
      (identify selector, property and value). Selector forms
15. Write a program to apply different types of selector forms:
    - Simple selector (element, id, class, group, universal)
    - Combinator selector (descendant, child, adjacent sibling, general sibling)
    - Pseudo-class selector
    - Pseudo-element selector
    - Attribute selector
      CSS with Color, Background, Font, Text and CSS Box Model
16. Write a program to demonstrate the various ways you can reference a color in CSS.
17. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
18. Write a program using the following terms related to CSS font and text:
    i. font-size
    ii. font-weight
    iii. font-style
    iv. text-decoration
    v. text-transformation
    vi. text-alignment
19. Write a program, to explain the importance of CSS Box model using
    i. Content
    ii. Border
    iii. Margin
    iv. Padding

20. Applying JavaScript – internal and external, I/O, Type Conversion
21. Write a program to embed internal and external JavaScript in a webpage.
22. Write a program to explain the different ways for displaying output.
23. Write a program to explain the different ways for taking input.
24. Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not
    JavaScript Pre-defined and User-defined Objects
25. Write a program using document object properties and methods.
26. Write a program using window object properties and methods.
27. Write a program using array object properties and methods.
28. Write a program using math object properties and methods.
29. Write a program using string object properties and methods.
30. Write a program using regex object properties and methods.
31. Write a program using date object properties and methods.
32. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.
33. JavaScript Conditional Statements and Loops
34. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
35. Write a program to display weekdays using switch case.
36. Write a program to print 1 to 10 numbers using for, while and do-while loops.
37. Write a program to print data in object using for-in, for-each and for-of loops.
38. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not.
    (Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e. $1^3 + 5^3 + 3^3 = 153$)
39. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's.
    (Eg: If deposited amount is Rs.163, the output should be 1–100's, 1–50's, 1–10's, 1–2's & 1–1's)
40. JavaScript Functions and Events
41. Design a appropriate function should be called to display
    i. Factorial of that number
    ii. Fibonacci series up to that number
    iii. Prime numbers up to that number
    iv. Is it palindrome or not
42. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
    i. Factorial of that number
    ii. Fibonacci series up to that number
    iii. Prime numbers up to that number
    iv. Is it palindrome or not
43. Write a program to validate the following fields in a registration page:
44. Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
45. Mobile (only numbers and length 10 digits)
46. E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

Textbooks:

1. Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
2. Web Programming with HTML5, CSS and JavaScript, John Dean, Jones & Bartlett Learning, 2019 (Chapters 1–11).
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, 2nd edition, APress, O'Reilly.

Web Links:

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs
5. https://www.w3schools.com/typescript

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1	0	2	2

(23A49901) DESIGN THINKING FOR INNOVATION
(Common to All Branches)

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes:

CO1: Define the concepts related to design thinking. (L1, L2)
CO2: Explain the fundamentals of Design Thinking and innovation. (L1, L2)
CO3: Apply the design thinking techniques for solving problems in various sectors. (L3)
CO4: Analyse to work in a multidisciplinary environment. (L4)
CO5: Evaluate the value of creativity. (L5)
CO6: Formulate specific problem statements of real-time issues. (L3, L6)

UNIT I – Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design - dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, new materials in industry.

UNIT II – Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations.
Tools of design thinking – person, customer, journey map, brainstorming, product development.

Activity:
Every student presents their idea in three minutes.
Every student can present design process in the form of flow diagram or flow chart etc.
Every student should explain about product development.

UNIT III – Innovation

Art of innovation, difference between innovation and creativity, role of creativity and innovation in organizations – Creativity to Innovation – Teams for innovation – Measuring the impact and value of creativity.

Activity:
Debate on innovation and creativity, flow and planning from idea to innovation, debate on value-based innovation.

UNIT IV – Product Design

Problem formation, introduction to product design, product strategies, product value, product planning, product specifications – innovation towards product design – case studies.

Activity:
Importance of modelling, how to set specifications, explaining their own product design.

UNIT V – Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization.
Design thinking to meet corporate needs – Design thinking for Startups – Defining and testing Business Models and Business Cases – Developing & testing prototypes.

Activity:
How to market our own product, about maintenance, reliability and plan for startup.

Textbooks:

1. Tim Brown, *Change by Design*, Harper Collins (2009)
2. Idris Mootee, *Design Thinking for Strategic Innovation*, 2013, John Wiley & Sons

Reference Books:

1. David Lee, *Design Thinking in the Classroom*, Ulysses Press
2. Shrutin N Shetty, *Design the Future*, Norton Press
3. William Lidwell, *Universal Principles of Design* – Kritina Holden, Jill Butter
4. Chesbrough H., *The Era of Open Innovation* – 2013

Online Learning Resources:

1. https://nptel.ac.in/courses/110/106/110106124/
   https://nptel.ac.in/courses/109/104/109104109/
2. https://swayam.gov.in/nd1_noc19_mg60/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), ANANTHAPURAMU – 515002 (A.P), INDIA
B.Tech – R23 CURRICULUM

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagement

Introduction

Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development. Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.

Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships/Apprenticeships/On the Job Training, whenever there is an exigency when students cannot pursue their summer internships.
The specific objectives are:

• To sensitize the students to the living conditions of the people who are around them.
• To help students to realize the stark realities of society.
• To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability.
• To make students aware of their inner strength and help them to find new/out-of-box solutions to social problems.
• To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
• To help students to initiate developmental activities in the community in coordination with public and government authorities.
• To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

• Every student should put in 6 weeks for the Community Service Project during the summer vacation.
• Each class/section should be assigned with a mentor.
• Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like youth, women, housewives, etc.
• A logbook must be maintained by each of the students, where the activities undertaken/involved to be recorded.
• The logbook has to be countersigned by the concerned mentor/faculty in charge.
• An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.

The final evaluation to be reflected in the grade memo of the student.
The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.

Minor project reports should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
Award of marks shall be made as per the guidelines of Internship/Apprentice/On-the-Job Training.

Procedure

A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.

The Community Service Project is a twofold one:

First

The student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers; rather, it could be another primary source of data.

Second

The student/s could take up a social activity, concerning their domain or subject area. The different areas could be like:

• Agriculture
• Health
• Marketing and Cooperation
• Animal Husbandry
• Horticulture
• Fisheries
• Sericulture
• Revenue and Survey
• Natural Disaster Management

• Irrigation
• Law & Order
• Excise and Prohibition
• Mines and Geology
• Energy
• Internet
• Free Electricity
• Drinking Water

EXPECTED OUTCOMES

Benefits of Community Service Project to Students

Learning Outcomes

1. Positive impact on students' academic learning
2. Improves students' ability to apply what they have learned in the "real world"
3. Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
4. Improved ability to understand complexity and ambiguity

Personal Outcomes

• Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
• Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

• Reduced stereotypes and greater inter-cultural understanding
• Improved social responsibility and citizenship skills
• Greater involvement in community service after graduation

Career Development

• Connections with professionals and community members for learning and career opportunities
• Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

• Stronger relationships with faculty
• Greater satisfaction with college
• Improved graduation rates

Benefits of Community Service Project to Faculty Members

• Satisfaction with the quality of student learning
• New avenues for research and publication via new relationships between faculty and community

• Providing networking opportunities with engaged faculty in other disciplines or institutions
• A stronger commitment to one's research

Benefits of Community Service Project to Colleges and Universities

• Improved institutional commitment
• Improved student retention
• Enhanced community relations

Benefits of Community Service Project to Community

• Satisfaction with student participation
• Valuable human resources needed to achieve community goals
• New energy, enthusiasm and perspectives applied to community work
• Enhanced community-university relations

Suggestive List of Programmes under Community Service Project

For Engineering Students

• Water facilities and drinking water availability
• Health and hygiene
• Stress levels and coping mechanisms
• Health intervention programmes
• Horticulture
• Herbal plants
• Botanical survey
• Zoological survey
• Marine products
• Aquaculture
• Inland fisheries
• Animals and species
• Nutrition
• Traditional healthcare methods
• Food habits
• Air pollution
• Water pollution
• Plantation
• Soil protection
• Renewable energy
• Plant diseases
• Yoga awareness and practice
• Healthcare awareness programmes and their impact
• Use of chemicals on fruits and vegetables
• Organic farming
• Crop rotation
• Flouryculture
• Access to safe drinking water
• Geographical survey
• Geological survey
• Sericulture
• Study of species

• Food adulteration
• Incidence of Diabetes and other chronic diseases
• Human genetics
• Blood groups and blood levels
• Internet Usage in Villages
• Android Phone usage by different people
• Utilisation of free electricity to farmers and related issues
• Gender ratio in schooling level – observation

Awareness Campaigns (Complementary Programmes)

Programs for School Children

• Reading Skill Program (Reading Competition)
• Preparation of Study Materials for the next class
• Personality/Leadership Development
• Career Guidance for X class students
• Screening Documentary and other educational films
• Awareness Program on Good Touch and Bad Touch (Sexual abuse)
• Awareness Program on Socially relevant themes

Programs for Women Empowerment

• Government Guidelines and Policy Guidelines
• Women's Rights
• Domestic Violence
• Prevention and Control of Cancer
• Promotion of Social Entrepreneurship

General Camps

• General Medical camps
• Eye Camps
• Dental Camps
• Importance of protected drinking water
• ODF awareness camp
• Swatch Bharath
• AIDS awareness camp
• Anti-Plastic Awareness
• Programs on Environment
• Health and Hygiene
• Hand wash programmes
• Commemoration and Celebration of important days

Programs for Youth Empowerment

• Leadership
• Anti-alcoholism and Drug addiction
• Anti-tobacco
• Awareness on Competitive Examinations
• Personality Development

Common Programs

• Awareness on RTI
• Health intervention programmes
• Yoga
• Tree plantation
• Programs in consonance with the Govt. Departments like:
Agriculture, Health, Marketing and Cooperation, Animal Husbandry, Horticulture, Fisheries, Sericulture, Revenue and Survey, Natural Disaster Management, Irrigation, Law & Order, Excise and Prohibition, Mines and Geology, Energy

Role of Students

• Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
• For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
• As and when required the College faculty themselves act as Resource Persons.
• Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
• And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.
• An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project

Activity Duration: 8 weeks

Preliminary Survey (One Week)

• A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
• A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.)
• The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

Community Awareness Campaigns (One Week)

Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

Community Immersion Programme (Three Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them.
This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

Community Exit Report (One Week)

During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration.
This report will be a basis for the next batch of students visiting that habitation.
The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

Throughout the Community Service Project, a daily logbook needs to be maintained by the student batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING(AUTONOMOUS): ANANTHAPURAMU–515002(A.P) INDIA

B. TECH R23 CURRICULUM

B. Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

IYear B. Tech. AI & ML–I Semester

L	T	P	C
1	0	4	3

Course Objectives:

(23A10301) ENGINEERING GRAPHICS

(Commonto CIVIL,MECH,CHEM,AI&ML)

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing.
- To impart knowledge on the projection of points, lines and plane surfaces.
- To improve the visualization skills for better understanding of projection of solids.
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

Course Outcomes:

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
CO3: Understand and draw projection of solids in various positions in first quadrant.
CO4: Explain principles behind development of surfaces.
CO5: Prepare isometric and perspective sections of simple solids.

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.
Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.
Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes.

Projections of Planes: Regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids : Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Developmentof Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views, Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D & 3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination).

Textbook:

1. N.D.Bhatt, Engineering Drawing, Charotar Publishing House,2016.

Reference Books:

1. Engineering Drawing, K.L.Narayanaand P.Kannaiah,Tata Mc Graw Hill,2013.
2. Engineering Drawing,M.B.Shahand B.C.Rana,Pearson Education Inc,2009.
3. Engineering Drawingwithan Introductionto Auto CAD,Dhananjay Jolhe,Tata Mc Graw Hill,2017.

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B. TECH R23 CURRICULUM

B. Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

IYear B.Tech.AI&ML–ISemester

L	T	P	C
3	0	0	3

(23A10501) INTRODUCTION TO PROGRAMMING

(Common to All branches)

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

Course Outcomes: A student after completion of the course will be able to
CO1: Understand basics of computers, the concept of algorithm and algorithmic thinking.
CO2: Analyse a problem and develop an algorithm to solve it.
CO3: : Implement various algorithms using the C programming language.
CO4: Understand more advanced features of C language.
CO5: Develop problem-solving skills and the ability to debug and optimize the code.

UNIT I : Introduction to Programming and Problem Solving
History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program - Algorithms, flowcharts (Using Dia Tool), pseudocode. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.
Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT II : Control Structures
Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

UNIT III : Arrays and Strings
Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

UNIT IV : Pointers & User Defined Data types
Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types - Structures and Unions.

UNIT V : Functions & File Handling
Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers,arrays as parameters.Scope and Life time of Variables,Basicsof File Handling

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B. TECH R23 CURRICULUM

B. Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

Note : The syllabus is designed with C Language as the fundamental language of implementation**.**

Textbooks:

1. "The C Programming Language", Brian W.Kernighanand Dennis M.Ritchie,Prentice-Hall,1988.
2. Schaum's Outline of Programming with C,Byron SGottfried,Mc Graw-Hill Education,1996.

Reference Books:

1. Computing fundamentals and C Programming, Balagurusamy,E.,Mc Graw-Hill Education,2008.
2. Programming in C, Rema Theraja,Oxford,2016,2nd edition.
3. C Programming, A Problem Solving Approach,Forouzan,Gilberg,Prasad,CENGAGE,3rd edition.

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B. TECH R23 CURRICULUM

B. Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

IYear B.Tech.AI&ML–ISemester

(2310503)IT WORKSHOP

(Common to CIVIL,MECH,CHEM,AI&ML)

L	T	P	C
0	0	2	1

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables.
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS.
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning.
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spreadsheets and Presentation tools.

Course Outcomes:

CO1: Perform Hardware trouble shooting.
CO2: Understand Hardware components and interdependencies.
CO3: Safeguard computer systems from viruses/worms.
CO4: Document/Presentation preparation.
CO5: Perform calculations using spreadsheets..

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.
Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.
Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.
Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.
Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva.

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting.

Finally students should demonstrate, to the instructor, how to access the websites an demail. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.
Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block popups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La Te X and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La Te X and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La Te X and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
Task 2: Using La Te X and Word to create a project certificate. Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La Te X and Word.
Task 3: Creating project abstract Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
Task 4: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

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

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, autofill, Formatting Text.
Task 2: Calculating GPA - . Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

LOOKUP/VLOOKUP

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

POWERPOINT

Task 1: Students will be working on basic powerpoint utilities and tools which help them create basic powerpoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in Power Point.
Task 2: Interactive presentations - Hyperlinks, Inserting – Images, Clip Art, Audio, Video, Objects, Tables and Charts.
Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slideslotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – Chat GPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.
Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"
Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."
Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

Comdex Information Technology course toolkit, Vikas Gupta, WILEY Dreamtech, 2003
The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dreamtech, 2013, 3rd edition
Introduction to Information Technology, IT Education Solutions limited, Pearson Education, 2012, 2nd edition
PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
La Te X Companion, Leslie Lamport, PHI/Pearson.
IT Essentials PC Hardware and Software Companion Guide, David Anfinson and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan – CISCO Press, Pearson Education, 3rd edition

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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B. TECH R23 CURRICULUM

B. Tech.– (ARTIFICIAL INTELLENCE & MACHINE LEARNING)

IYear B.Tech.AI&ML–ISemester

(23A15202) ENGINEERING PHYSICS LAB

(Common to all Branches)

L	T	P	C
0	0	2	1

Course Objectives:

- ➢ Understands the concepts of interference, diffraction and their applications.
- ➢ Understand the role of optical fiber parameters in communication.
- ➢ Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor.
- ➢ Illustrates the magnetic and dielectric materials applications.
- ➢ Apply the principles of semiconductors in various electronic devices.

Course Outcomes: The students will be able to

CO1: Bridging the gap between the Physics in school at 10+2 level and UG level engineering courses.

CO2: To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications.

CO3: Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law – Learning the structural analysis through X-ray diffraction techniques.

CO4: Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of de Broglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals.

CO5: Calculate the band gap of a given semiconductor.

CO6: Identify the type of semiconductor using Halleffect.

List of Engineering Physics Experiments :

1. Determination of radius of curvature of a given plano convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Determination of dispersive power of prism.
4. Verification of Brewster's law
5. Determination of the resistivity of semiconductor by four probe method.
6. Determination of energy gap of a semiconductor using p-n junction diode.
7. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
8. Determination of dielectric constant using charging and discharging method.
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method.
11. Determination of wavelength of Laser light using diffraction grating.
12. Estimation of Planck's constant using photoelectric effect.
13. Determination of temperature coefficients of a thermistor.
14. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non- uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any TEN of the listed experiments are to be conducted.Out of which any TWO experiments may be conducted in virtual mode.

References:

1. ATextbookof Practical Physics-S.Balasubramanian,M.N.Srinivasan,S.Chand Publishers,2017.

Web Resources

1. www.vlab.co.in
2. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype