Zeal Education Society's

ZEAL COLLEGE OF ENGINEERING & RESEARCH, PUNE – 41

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

*NAAC Accredited with **A+** Grade / ISO 21001:2018*

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Curriculum Structure and Syllabus of

F.Y. B. Tech. – Artificial Intelligence and Data Science

(With effect from - Academic Year 2024- 25)

VISION OF THE INSTITUTE

To be a premier institute in technical education by imparting academic excellence, research, social and entrepreneurial attitude.

MISSION OF THE INSTITUTE

- To achieve academic excellence through innovative teaching and learning process.
- To imbibe the research culture for addressing industry and societal needs.
- To inculcate social attitude through community engagement initiatives.
- To provide conducive environment for building the entrepreneurial skills.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

VISION:

To promote quality education with a strong foundation of Artificial Intelligence and Data Science Engineering that enables self-development, entrepreneurship, and intellectual property to become a successful IT Professional.

MISSION:

M1: To empower students for developing intelligent systems and innovative products through academic excellence.
M2: To produce competent computer professionals to serve the needs of the society by preserving human core values.
M3: To provide research culture and conductive environment for entrepreneurship and to solve industry needs.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1: To provide graduates with the proficiency to utilize the fundamental knowledge of basic sciences, mathematics, Artificial Intelligence, data science and statistics to build systems that require management and analysis of large volume of data.
PEO2: To enrich graduates with necessary technical skills to pursue pioneering research in the field of AI and Data Science and create disruptive and sustainable solutions for the welfare of ecosystems.
PEO3: To enable graduates to think logically, pursue lifelong learning and collaborate with an ethical attitude in a multidisciplinary team.

PROGRAM OUTCOMES (POs):

PO1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

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

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

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, networking, artificial intelligence and data science for efficient design of computer-based systems of varying complexities**.**

PSO2: Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success**.**

PSO3: Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and to have a zest for higher studies**.**

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

LIST OF ABBREVIATIONS

Abbreviation	Description
BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Programme Core Course
PEC	Programme Elective Course
MDM	Multidisciplinary Minor
OE	Open Elective - Other than a particular program
VSEC	Vocational and Skill Enhancement Course
AEC	Ability Enhancement Course
ENTR	Entrepreneurship
EC	Economics
MC	Management Courses
IKS	Indian Knowledge System
VEC	Value Education Courses
RM	Research Methodology
CEP	Community Engagement Project
FP	Field Project
PROJ	Project
INT	Internship
OJT	On Job Training
CC	Co-curricular Courses
HSSM	Humanities Social Science and Management
ELC	Experiential Learning Course
B. Tech	Bachelor of Technology
L	Lecture
P	Practical
T	Tutorial
H	Hours
CR	Credits
CIE	Continuous Internal Evaluation
ETE	End Term Evaluation
TH	Theory
Tut	Tutorial
TW	Term Work
OR	Oral
PR	Practical

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

First Year B. Tech. - Artificial Intelligence and Data Science: Semester - I

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
ADBS101	BSC	Linear Algebra and Differential Calculus	3	-	-	3	3	-	3	40	60	-	-	-	100
ADBS102	BSC	Engineering Chemistry	2	2	-	4	2	1	3	40	60	25	-	-	125
ADES101	ESC	Basic Electrical and Electronics Engineering	3	2	-	5	3	1	4	40	60	50	-	-	150
ADES102	ESC	Problem Solving and Logic Building	2	2	-	4	2	1	3	40	60	50	-	-	150
ADVS101	VSEC	Web Application Development	-	4	-	4	-	2	2	-	-	50	-	-	50
ADCC101	CC	Professional Development - I	-	4	-	4	-	2	2	-	-	50	-	-	50
ADCC102	CC	Liberal Learning – I*	-	2	-	2	-	1	1	-	-	25	-	-	25
ADIK101	HSSM - IKS	Indian Knowledge System & Financial Literacy	2	-	-	2	2	-	2	-	-	50	-	-	50
Total			**12**	**16**	**-**	**28**	**12**	**8**	**20**	**160**	**240**	**300**	**-**	**-**	**700**

*** Liberal Learning – I: Choose any one from the following:**

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	ADCC102A	Guitar	6.	ADCC102F	Basketball
2.	ADCC102B	Singing	7.	ADCC102G	Cricket
3.	ADCC102C	Cinematography	8.	ADCC102H	Rifle and Pistol Shooting
4.	ADCC102D	Dance	9.	ADCC102I	Volleyball
5.	ADCC102E	Synthesizer	10.	ADCC102J	Football

BoS Chairman

ZES's Zeal College of Engineering & Research PU/PN/Engg./285/2007 Narhe, Pune-41

Director
ZES's Zeal College of Engineering & Research
Narhe, Pune - 411041.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

First Year B. Tech. - Artificial Intelligence and Data Science: Semester - II

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
ADBS203	BSC	Probability and Statistics	3	-	-	3	3	-	3	40	60	-	-	-	100
ADBS204	BSC	Engineering Physics	2	2	-	4	2	1	3	40	60	25	-	-	125
ADES203	ESC	Fundamentals of Computer Systems and Networking	2	2	-	4	2	1	3	40	60	25	-	-	125
ADES204	ESC	Fundamentals Python Programming	2	2	-	4	2	1	3	40	60	25	-	-	125
ADPC201	PCC	Basic of Artificial Intelligence and it's Applications	3	-	-	3	3	-	3	40	60	-	-	-	100
ADVS202	VSEC	Generative AI Tools and Prompt Engineering	-	4	-	4	-	2	2	-	-	25	-		25
ADCC203	CC	Professional Development - II	-	4	-	4	-	2	2	-	-	25	-	-	25
ADCC204	CC	Liberal Learning – II*	-	2	-	2	-	1	1	-	-	25	-	-	25
ADAE201	HSSM - AEC	IT Proficiency	-	4	-	4	-	2	2	-	-	25	-	-	25
ADIN201	ELC - INT	Internship - I	5 Week				2		2	-	-	25	-	-	25
Total			**12**	**20**	**-**	**32**	**12**	**12**	**24**	**200**	**300**	**200**	**-**	**-**	**700**

*** Liberal Learning – II: Choose any one from the following:**

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	ADCC204A	Guitar	6.	ADCC204F	Basketball
2.	ADCC204B	Singing	7.	ADCC204G	Cricket
3.	ADCC204C	Cinematography	8.	ADCC204H	Rifle and Pistol Shooting
4.	ADCC204D	Dance	9.	ADCC204I	Volleyball
5.	ADCC204E	Synthesizer	10.	ADCC204J	Football

 # Internship I: After Semester II during Vacation Period.

BoS Chairman

ZES's Zeal College of Engineering & Research PU/PN/Engg./285/2007 Narhe, Pune-41

Director
ZES's Zeal College of Engineering & Research Narhe, Pune - 411041.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

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SYLLABUS

SEMESTER - I

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** I		
Course: Linear Algebra and Differential Calculus							**Code:** ADBS101		
Teaching Scheme (Hrs/week)				**Evaluation Scheme**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

Prerequisites:

Basic concept of Differentiation, Integration, Maxima and Minima, Matrices and Determinants.

Course Objectives:

1. To acquaint the students to rank of matrix, solution of simultaneous equations, Eigen values and Eigen vectors.
2. To acquire techniques of the expansion of functions about any point and to evaluate the indeterminate forms of limits.
3. To make students familiar with multivariable differentiation and its applications.
4. To introduce to student awareness of concept of Fourier series.

Course Outcomes: After completion of this course, students will be able to -

CO1	Use of matrix method for solving system of simultaneous linear equations.
CO2	Find Eigen values and Eigen vectors of the matrix.
CO3	Describe the power series expansion of a given function and evaluate limits.
CO4	Understand the basic concepts of partial derivatives**.**
CO5	Evaluate partial derivatives to estimate maxima and minima of function of multiple variables.
CO6	Determine the Fourier series representation and harmonic analysis for design.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**System of Linear Equations:** Rank of a matrix, System of linear equations, Linear dependence and independence of vectors, Linear and orthogonal transformations, Application to problems in engineering.	7
2.	**Eigen Values and Eigen Vectors, Diagonalization:** Eigen values and Eigen vectors, Cayley-Hamilton theorem, Diagonalization of a matrix, Reduction of quadratic forms to canonical form by linear and orthogonal transformations.	7
3.	**Differential Calculus:** Rolle's theorem, Mean value theorems, Taylor's series and Maclaurin's series, Expansion of functions using standard expansions, Indeterminate forms.	7
4.	**Partial Differentiation:** Partial derivatives of first and higher orders, Euler's theorem on homogeneous functions, Partial derivative of composite functions, Total derivative and Implicit differentiation	7
5.	**Applications of Partial Differentiation:** Jacobians and their applications, Errors and Approximations. Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.	7
6.	**Fourier Series:** Definition, Dirichlet's conditions, Full range Fourier series, Half range Fourier series, Harmonic analysis.	7
	TOTAL	**42**

Text Books:

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill
2. B. S. Grewal , "Higher Engineering Mathematics", Khanna Publication
3. Howard Anton & Chris Rorres, "Elementary Linear Algebra" , John Wiley & sons.
4. Seymour Lipschutz, Marc Lipson, "Schaum's outlines of Linear Algebra", 6th edition McGraw-Hill Education (India) Private Limited, New Delhi.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd.
2. M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", Thomson Learning.
4. P. N. Wartikar and J. N. Wartikar, "Applied Mathematics (Vol. I & Vol. II)", Vidyarthi Griha Prakashan, Pune.
5. Ron Larson and David C. Falvo, "Elementary Linear Algebra" ,Houghton Mifflin Harcourt Publishing Company

E-Resources:

1. A NPTEL Course on "Engineering Mathematics-I" IIT Khargpur - https://www.youtube.com/watch?v=4QFsiXfgbzM&list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5
2. Paathshala Pandit , "Rank of Matrix | Vector Space | Engineering Mathematics" - https://www.youtube.com/watch?v=jHU3yasfpKw&list=PLU4tRlorU5wWPpemhfdG0Yc4zNiICSMVO&index=1
3. Eigenvalues and Eigenvectors | Properties and Important Result | Matrices- https://www.youtube.com/watch?v=1wjXVdwzgX8
4. Taylor Series | Numericals | Maths 1 | B.Tech 1st year | Engineering | BSc - https://www.youtube.com/watch?v=0bHky1ocA1Y
5. Partial Differentiation Example And Solution | Multivariable Calculus - https://www.youtube.com/watch?v=eTp5wq-cSXY&list=PLU6SqdYcYsfLuIJdHwY92aGBg5-uRHBOb&index=1

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)								**Semester:** I	
Course: Engineering Chemistry								**Code:** ADBS102	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	02	-	03	40	60	25	-	-	125

Prerequisites:

Basic knowledge of volumetric analysis, structure property relationship, classification and properties of polymers, electromagnetic radiation, electrochemical series.

Course Objectives:

1. To familiarize the students with the basic phenomenon/concepts of chemistry and its applications in various fields of Engineering.
2. To impart knowledge of technologies involved in water analysis to improve water quality.
3. To learn significance science of corrosion and preventive methods used for minimizing corrosion.
4. To understand structure, properties and applications of speciality polymers and nanomaterials.

Course Outcomes: After completion of this course, students will be able to -

CO1	Analyze water softening parameters.
CO2	Utilize different analytical methods for analysis of various chemical compounds.
CO3	Understand the mechanism of destruction of metals (corrosion) and effective preventive measures.
CO4	Explore the knowledge of advanced engineering materials for various engineering applications.
CO5	Analyze fuel and suggest use of alternative fuels.
CO6	Familiarize with classification, properties and applications of nanomaterials.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Water Technology:** Introduction, Chemical Analysis of Water- Hardness; Temporary and Permanent, Alkalinity (Hydroxide, Carbonate and Bicarbonate), Softening Methods: Zeolite and Demineralization Process, Water Purification: Reverse Osmosis. Simple Numerical on Hardness Determination and Alkalinity Calculation.	5
2.	**Instrumental Methods of Analysis:** Types of analysis: Quantitative and Qualitative analysis Introduction, Instrumentation and Applications of following methods: Colorimetry, pHmetry (Titration of Strong acid versus Strong base), Conductometry (Titration of Strong acid versus Strong base)	5
3.	**Corrosion Science:** Introduction, Types of Corrosion-Dry and Wet corrosion, Wet Corrosion Mechanism: Hydrogen Evolution and Oxygen Absorption, Factors affecting rate of corrosion. Methods of prevention of corrosion: Cathodic Protection (Sacrificial Anode), Anodic Protection (Anodizing), Methods to apply Metallic Coatings-Hot dipping, Electroplating.	4

4.	**Engineering Polymers:** Polymers: Introduction, Definition of Polymer, Monomer and Functionality of monomers Speciality Polymers: Introduction, Preparation, Properties and Applications of the following polymers: 1. Engineering Thermoplastic: Polycarbonate 2. Conducting Polymer: Polyacetylene Polymer Composites: Introduction, Constituents of composite, Advantages over conventional materials, Applications, Fiber Reinforced Plastic (FRP)-Glass reinforced and Carbon reinforced.	5
5.	**Fuels and Combustion:** Introduction, Calorific value - Definition, Gross and Net calorific value, Determination of Calorific value: Principle, Construction and Working of Bomb Calorimeter (Simple Numerical), Solid fuel: Coal: Analysis of Coal-Proximate (Simple Numerical). Alternate fuels: Biodiesel and Power alcohol. Hydrogen as future fuel: Production, Advantages, Storage and Applications in Hydrogen fuel cell.	5
6.	**Nanomaterials:** Introduction, Classification of Nanomaterials Based on Dimensions, Nanoscale materials: Structure, Properties and Applications of Graphene and Quantum dots (semiconductor nanoparticles), Importance of Nanotechnology in engineering applications.	4
	TOTAL	**28**

List of Experiments:

A. Lab Experiments (Any Seven)

1. Determination of hardness of water by EDTA method.
2. Determination of alkalinity of water.
3. Determination of strength of strong acid using pH meter.
4. Determination of maximum wavelength of absorption of $CuSO_4$/$FeSO_4$/$KMnO_4$, verify Beer's law and find unknown concentration of given sample.
5. Titration of a mixture of strong acid with strong base using Conductometer.
6. Preparation of phenol-formaldehyde/urea-formaldehyde resin.
7. Proximate analysis of coal.
8. Coating of copper or zinc on iron plate using electroplating.
9. Determination of the molecular weight of a polymer by using Ostwald's Viscometer.

B. Demonstration (virtual) (Any One)

10. Demonstration of effect of environmental conditions on metal by weight loss method.
11. Synthesis of oxide nanoparticles.

C. Mandatory visit to chemical industry/research laboratory/water treatment plant.

Text Books:

1. O.G. Palanna," Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd.
2. Dara S. S., Umare S. A., "Textbook of Engineering Chemistry", 12th Ed, S. Chand & Com Ltd.
3. Jain and Jain, "Engineering Chemistry", 16th Ed, Dhanpat Rai and Co. (Pvt.) Ltd., Delhi.

Reference Books:

1. G. R. Chatwal& S. K. Anand, "Instrumental Methods of Chemical Analysis", Himalaya Publishing House.
2. Dr. Sunita Rattan; A Textbook of Engineering Chemistry; 3rd Ed, S. K. Kataria & Sons, New Delhi
3. V. R. Gowarikar, N. V. Viswanathan, Jayadev Sreedhar, "Polymer Science", Wiley Eastern Limited.
4. Billmeyer F. W., "Textbook of polymer science", John Wiley and Sons.
5. B. Sivasankar, "Engineering Chemistry", Tata Mcgraw-Hill Education Publishing company Limited.
6. G. L. Hornyak, J. J. Moone, H. F. Tihhale, J. Dutta "Fundamentals of Nanotechnology", CRC press.

E-Resources:

MOOC / NPTEL/YouTube Links:

1. NPTEL Course on Corrosion, IISc Banglore : http://nptel.ac.in/courses/113108051/
2. NPTEL Course on Polymer, IIT Kharagpur: http://nptel.ac.in/courses/104105039/, http://nptel.ac.in/courses/104103071/40
3. NPTEL Course on Water Technology, IIT Kanpur: http://nptel.ac.in/courses/105104102/
4. NPTEL Course on UV-Visible Spectroscopy: http://nptel.ac.in/courses/102103044/4
5. NPTEL Course on Energy Sources: http://nptel.ac.in/courses/103105110/4
6. NPTEL Course on "Engineering Chemistry-I, https://nptel.ac.in/courses/122/106/122106028/
7. NPTEL Course on "Fundamentals of Spectroscopy", NCL,IISER Pune https://nptel.ac.in/courses/104/106/104106122/

Virtual Labs:

1. NITK Surathkal: Hardness of water: https://ee1-nitk.vlabs.ac.in/exp/determination-of-hardness/simulation.html#:
2. NITK Surathkal: Alkalinity of water: https://ee1-nitk.vlabs.ac.in/exp/determination-of-alkalinity/ simulation.html
3. IIT Hyderabad: Colorimeter, verification of Beer's law, https://mas-iiith.vlabs.ac.in/exp/beer-law/ simulation.html
4. IIT Kanpur: Preparation of phenol-formaldehyde resin, http://ebootathon com/labs/beta/chemistry/ EngineeringChemistryLab/exp1/simulation.html
5. Amrita University: Determination of viscosity average molecular weight polymer, https://pcv-au.vlabs.ac.in/physicalchemistry/Determination_of_ViscosityAverageMolecularWeightofPolymer/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence and Data Science)							**Semester:** I		
Course: Basic Electrical and Electronics Engineering							**Code:** ADES101		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	02	-	04	40	60	50	-	-	150

Prerequisites:

Basic Mathematics, Basic Knowledge of Computer Hardware

Course Objectives:

1. To understand fundamental electrical quantities and basic DC circuit analysis techniques and their application in real-world and computer systems.
2. To comprehend AC circuit fundamentals and analyze power in AC circuits, including its role in power supplies for computer systems.
3. To explore the working principles of electrical machines and their efficient use in minimizing power consumption in industrial and computer systems.
4. To understand the basic principles of semiconductor materials and diodes, and their applications in power regulation for electronic devices.
5. To study the working principles and applications of transistors and amplifiers in switching and amplification circuits for computing devices.
6. To gain knowledge of digital logic circuits, number systems, and Boolean algebra, with applications in digital data processing and computer systems.

Course Outcomes: After completion of this course, student shall be able to

CO1	Understand basic circuit laws to analyze simple DC circuits used in computing hardware.
CO2	Analyze AC circuits and understand their significance in powering computing systems.
CO3	Understand the function of transformers and electrical machines, especially their roles in power distribution for computing systems
CO4	Understand the basic semiconductor devices used in power regulation and protection within computer systems.
CO5	Gain knowledge of transistor-based devices and their use in digital switching, amplification, and signal processing in computers.
CO6	Understand the fundamental building blocks of digital systems, essential for understanding the functioning of modern computers and microprocessors.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Basics of DC Circuits and Circuit Analysis:** Introduction to Electrical Quantities: Charge, current, voltage, power, and energy. Ohm's Law and Simple Circuit Calculations: Relationship between current, voltage, and resistance. Kirchhoff's Laws: Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL). Basic Circuit Analysis Techniques: Series and parallel resistive circuits,	7

	Voltage and current division. Application in Computer Systems: Importance of power supply circuits and basic energy management in computing devices. Case Study: Analysis of household wiring systems and identifying safety concerns in real-world wiring.	
2.	**AC Circuits and Power:** AC Fundamentals: Sinusoidal waveforms: amplitude, frequency, and phase. RMS and average values. AC Circuit Components: Impedance in AC circuits (resistors, inductors, and capacitors). Power in AC Circuits: Real power, reactive power, apparent power, and power factor. Electricity Consumption Calculation: Calculation of electricity consumption for households and industries, Power transmission and distribution basics. Application in Computer Systems: Role of AC circuits in computer power supplies and transformers. Case Study: Analysis of electricity bills for homes and small industries, Understanding tariff systems, energy consumption patterns, and energy-saving techniques.	7
3	**Electrical Machines and Power Consumption:** Basics of Electrical Machines: Transformers, AC motors, DC motors, and their applications. Working Principles: Single-phase and three-phase systems, Transformer efficiency and losses. Energy Meters and Billing: Introduction to energy meters used in billing systems, Energy-saving techniques in industrial and residential settings. Application in Computer Systems: Usage of transformers and motors in power supply and cooling systems of computers. Case Study: Optimizing electrical energy consumption in industries: How to reduce power costs by using efficient machines and improving power factor.	7
4.	**Semiconductor Basics and Applications:** Introduction to Semiconductor Materials: Properties of intrinsic and extrinsic semiconductors. PN Junction Diode: Structure, working principle, and characteristics. Applications of Diodes: Rectifiers (half-wave, full-wave) and voltage regulation using Zener diodes. Application in Computer Systems: Use of diodes in voltage regulation, switching, and protection circuits for computers. Case Study: Design and analysis of a simple rectifier circuit used in a DC power supply for electronic devices.	7
5.	**Transistors and Amplifiers:** Introduction to Transistors: Bipolar Junction Transistors (BJTs) and Field Effect Transistors (FETs). Working Principles: BJTs and FETs configurations (common-emitter, common-source). Transistor Amplifiers: Operation, biasing, and applications. Application in Computer Systems: Role of transistors in switching circuits and signal amplification in computing devices. Case Study: Designing a simple amplifier circuit for an audio system using a transistor and understanding the real-world challenges in amplifier design.	7
6.	**Digital Electronics Fundamentals:** Number Systems: Number systems (Binary, Octal, Decimal, Hexadecimal), Binary arithmetic (addition, subtraction, multiplication, division), Character representation (ASCII, Unicode). Logic Gates, De Morgan's Laws, Boolean	7

	Algebra: Basic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Simplification using Boolean algebra and Karnaugh Maps. Application in Computer Systems: Digital circuits for data processing, memory units, and arithmetic operations in computer processors.	
	TOTAL	**42**

List of Experiments:

Group A: Basics of Electrical Engineering Practical Assignments (Any 5)

1. Verify Ohm's law by measuring current and voltage across different resistors.
2. Apply Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) in a multi-loop DC circuit and validate results.
3. Measure and plot AC waveforms using an oscilloscope, determining amplitude, frequency, and phase.
4. Calculate impedance in RLC (Resistor-Inductor-Capacitor) circuits using AC voltage and current measurements.
5. Measure the efficiency and voltage regulation of a single-phase transformer.
6. Experiment with speed control methods of a DC motor and analyze performance.

Group B: Basics of Electronics Engineering Practical Assignments (Any 5)

1. Study the forward and reverse bias characteristics of a PN junction diode and plot the V-I characteristics.
2. Construct and analyze the performance of half-wave and full-wave rectifier circuits.
3. Use a Bipolar Junction Transistor (BJT) as a switch in a basic circuit and measure the output response.
4. Design and implement a common-emitter transistor amplifier circuit and measure voltage gain.
5. Implement basic logic gates (AND, OR, NOT) using ICs and verify their truth tables.
6. Implement basic logic gates (NAND, NOR, XOR) using ICs and verify their truth tables.

Text Books:

1. S.K. Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson Education.
2. V.K. Mehta and Rohit Mehta, S., "Principles of Electrical Engineering and Electronics", Chand Publications.
3. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education.

Reference Books:

1. Leonard S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.
2. H. Cotton, "Electrical Technology", CBS Publishers.
3. Donald A. Neamen, "Microelectronics: Circuit Analysis and Design", McGraw Hill Education.

E-Resources:

1. **NPTEL (National Program on Technology Enhanced Learning):**
   https://nptel.ac.in/
   - Course on Basic Electrical Circuits
   - Course on Semiconductor Devices
2. **Coursera:** https://www.coursera.org/
   - Courses related to Electrical Engineering and Electronics.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** I		
Course: Problem Solving and Logic Building							**Code:** ADES102		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	02	-	03	40	60	50	-	-	150

Prerequisites:

Basic Knowledge of Simple Mathematics, logic reasoning, Aptitude.

Course Objectives:

1. To equip students with foundational problem-solving skills.
2. To inculcate fundamental concepts of design thinking.
3. To utilize games to enhance problem-solving abilities.
4. To foster critical thinking and logic building using a variety of puzzles, emphasizing reasoning skills.
5. To equip students with the skills to design and interpret flowcharts and pseudocode, enabling them to systematically solve problems.
6. To develop students' skills in designing and implementing logic for real-time applications

Course Outcomes:

CO1	Inculcate various skills in problem solving.
CO2	Define the principles and need for design thinking.
CO3	Analyze and solve problem using games and puzzles.
CO4	Utilizing critical thinking techniques and logical deductions to solve problem.
CO4	Create and interpret flowcharts and pseudocode for a variety of basic algorithms.
CO5	Apply logical reasoning to solve real-world problems.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Problem Solving:** General Problem-Solving Concepts- Problem solving in everyday life, types of problems, problem solving with computers, difficulties with problem-solving, problem-solving aspects, top-down design. Problem Solving Strategies,	5
2	**Introduction to Design Thinking:** Definition of Design Thinking, Need of Design Thinking, Features of Design Thinking, Problem Solving and Design, Design thinking as Strategy of Innovation, Use of Design Thinking, Design Thinking-Attributes, The Principles of Design Thinking, The Five-step Process of Design Thinking(Empathize, Define, Ideate, Prototype, Test), Design Thinking-A Solution based thinking: Design Thinking vs. Scientific Method, Problem Focused vs. Solution Focused, Analysis vs. Synthesis, Divergent Thinking vs. Convergent Thinking , Roots of Design Thinking in Human Centric Design Process.	5
3	**Problem solving using Games:** Tic tac-toe game, coloring Map problem, Crypto Arithmetic problem, Wumpus world problem, Rubic Cube, Sudoku, chess , 8 puzzle problem, block world problem,	4

4.	**Logic Building using Puzzles:** Classical puzzles, Ordering puzzles, Sliding tile puzzles, logic puzzles, pattern recognition, crossword, riddles, Syllogisms, hidden object finding puzzles, reasoning puzzle,, Logic Grid Puzzles, Maze puzzle, Battleship (Puzzle), Balance Puzzles	5
5	**Flowchart and Pseudo code:** Introduction to flowchart, Basic symbols used in flowchart design, Rules for Creating Flowchart**,** Types of flowchart Advantages and disadvantages of flowchart. Definition and Importance of Pseudo code, Differences Between Pseudo code and Actual Code, Basic Syntax and Structure of Pseudo code, Basic Algorithms in Pseudocode, Draw a flowchart and write Pseudo code of Simple Interest, Largest Number, Sum of first N numbers, Prime Number, Sum of Multiple Inputs, Greatest Common Divisor, Bank Employee Bank Security Guard.	5
6.	**Application:** Logic building of real time Example-ERP Development, Website development, Matrix multiplication, Biometric, vending machine Logic, ATM Machine, Banking application, E ticket system, Navigation system	4
	TOTAL	**28**

List of Experiments:

1. Draw the flow chart and write the algorithm for the following problems
   a. Area of Circle
   b. To find whether the number is prime or not
   c. To print number from 1 to 10
2. Write a C Program to print the name, enrollment number, branch and semester of the student.
3. Write a Program to calculate Addition, Subtraction, Multiplication and Division of given two numbers using arithmetic operator.
4. Write a program to calculate the Simple Interest by accepting the values from the user. (formula: PRN/100).
5. Write a Program of swapping two values.
6. Write a Program to convert time from given seconds to total hours, minutes and seconds.
7. Write a Program to find ASCII value of given character.
8. Write a program to demonstrate the Type Conversion in C.
9. Write a C program to find the factorial of a given number.
10. Write a program to check whether the given number is prime or not.
11. To accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers.
12. Write a program to print following patterns:

a.	b.	c.	d.
*	1	12345	5 5 5 5 5
* *	12	1234	4 4 4 4
* * *	123	123	3 3 3
* * * *	12345	12	2 2
* * * * *		1	

Text Books:

1. Maureen Spankle, "Problem Solving and Programming Concepts", Pearson 9th edition.
2. V. Anton Spraul, "Think Like a Programmer", 1st Edition.
3. Donald J. Treffinger, K. Brian Dorval, and Scott G. Isaksen, "Creative Problem Solving: An Introduction," Prufrock Press.
4. Jesse Schel, "The Art of Game Design: A Book of Lenses".
5. A.B. Lawal, "Flowchart and Algorithm Basics: A Beginner's Guide".
6. Ivan Moscovich, "The Puzzle Universe: A History of Mathematics in 315 Puzzles," 1st Edition (2014).

Reference Books:

1. George Pólya, "How to Solve It: A New Aspect of Mathematical Method," Princeton University Press, 1945.
2. Shakuntala Devi, "Match Your Wits with the 'Human Computer': Puzzles to Puzzle You," Orient Paperbacks, 2006.
3. Michael Lewrick, Patrick Link, and Larry Leifer, "The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses, and Ecosystems," Wiley, 2018.
4. Alan B. Marcovitz, "Introduction to Logic Design," Cengage Learning, 2017.
5. Dave Gray, Sunni Brown, and James Macanufo, "Gamestorming: A Playbook for Innovators, Rulebreakers, and Changemakers," O'Reilly Media, 2010.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)								**Semester:** I	
Course: Web Application Development								**Code:** ADVS101	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	04	-	02	-	-	50	-	-	50

Prerequisites:

Knowledge of logic and any programming.

Course Objectives:

1. To understand HTML Fundamentals: elements, attributes, head, body structure.
2. To utilize CSS3 Techniques syntax, manage inclusion, and manipulate properties like color, background, and fonts.

Course Outcomes: After completion of this course, student will be able to -

CO1	Use HTML formatting tags to present content on web page.
CO2	Develop web page using list and hyperlinks.
CO3	Develop web pages using images, colors and backgrounds.
CO4	Design HTML forms using table and frames.
CO5	Apply presentation schemes on content using CSS.
CO6	Publish websites on internet or intranet.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to HTML:** Terminologies used in Web Design: World Wide Web (www), Web Pages, Web Site, Web Browsers, Web Servers and types of sites. Static vs. dynamic web sites, Search Engine. Web page structure: DOCTYPE, HTML, TITLE, HEAD, BODY and other meta tags with attributes. Block Level Elements: Headings, Paragraphs, Breaks, Divisions, Centered Text, Block Quotes, Preformatted text, types of Address, HR tag. Horizontal Rue. Text Level Elements: Bold, Italic, Teletype, Underline, Strikethrough, Superscript, Subscript, DIV tag, displaying special characters, comments.	10
2.	**Lists and Links:** Lists: Ordered Lists, Unordered Lists, Definition Lists, Nested Lists. Links: Absolute, Relative and Inline links, use image as link, link to an email address, button as link, types of links, linking various documents for internal and external links, to link different web page of same site, link different location on the same web page, a specific location on different web page of same site, to specific section within the document, inserting E-mail link.	9
3.	**Images, Colors and Background:** Image: Types of image format, jpg, bmp, png gif etc. IMG tag, alternate text, image alignment, HSPACE, VSPACE, wrapping text, height and width of images, Image as a link, Inserting Images, formatting image for sizing, alignment. Border and using other attributes with IMG tag.	9

	Colors and Backgrounds: The text color, color attribute of FONT tag, text attribute of BODY tag. bgcolor attribute of BODY tag, changing link colors: link, alink, vlink, attributes of BODY tag, Backgrounds: Inserting image as page background, background attributes of BODY tag, creating solid color page background.	
4.	**Table, Frames and Forms:** Table: Table tag with attributes. TABLE, <tr>, <th>, <td> tags. Border, cell spacing, cell padding, width, align, bgcolor attributes. Adding captions: CAPTION tag Formatting contents in the table cells: align, valign, bgcolor, height, width, nowrap attributes. Spanning rows and columns: rowspan and colspan attributes. Frames: Types of Frames with their attributes, Creating frames: FRAMESET tag – rows, cols attributes, FRAME tag – name, frame border, margin height, margin width, src, resize, scrolling Attributes, Use of NOFRAMES tag, Frame targeting. Forms: Creating basic form: FORM tag, action and method attributes, Form fields: Single line text field, password field, multiple line text area, radio buttons, and check boxes. Pull down menus: SELECT and OPTION tags. Buttons: submit, reset and generalized buttons. Formatting technique: Using table to layout form.	10
5.	**Cascading Style sheets:** Cascading Style Sheets: Different types of Style Sheets, Benefits of using CSS. Adding style to the document: Linking to style sheets, Embedding style sheets, Using inline style, Selectors: CLASS rules, ID rules. Style sheet properties: Font, text, box, color and background properties; Creating and Using a simple external CSS file; Using the internal and inline CSS; background and color gradients in CSS Setting font and text in style sheet using table layout.	9
6.	**Website Hosting:** Website Hosting: Concept of Internet and Intranet. Publishing website on Intranet, installing and configuring web server, uploading files on intranet site, access intranet-based website, publishing website site on Internet, hiring web space, uploading files using FTP, virtual hosting, access internet-based website.	9
	TOTAL	**56**

List of Experiments:

1. Create web page using structure tags to display sample message.
2. Create a web page for displaying a paragraph using formatting tags, HR tags.
3. Create a web page using text level and border level tags.
4. Design a web page for implementing ordered list and unordered list.
5. Create a web page to link:
   a. A different web page of same site.
   b. A different location on the same web page.
   c. A Specific location on different web page of same site.
6. Create a webpage which includes photos and align with the ALT property on the left, right, and center.
7. Insert images on web page using various attributes and set image as background.
8. Create a webpage containing any image and add a hyperlink to another webpage. Use width and height property for an image.
9. Create table within table and also insert an image within the data elements of the table.

10. Create a webpage that displays first year timetable. Make effective use of rowspan and colspan attributes. Make use of <th> tag.
11. Create a webpage that provides a form for filling information. The webpage must contain following elements:
    - Textbox
    - Radio buttons
    - Checkboxes
12. Create a webpage that provides a form for filling information. The webpage must contain following elements:
    - Buttons (Submit/Reset)
    - Text area
    - Textbox for passwords
13. Create a web page for demonstration of CSS by applying internal style, external and inline style.
14. Create a web page for demonstration of CSS responsive web design.
15. Create a website and host on open source.
16. Create a web page to represent personal portfolio.

Text Books:

1. Jon Duckett, "HTML & CSS: Design and Build Web Sites," Wiley.
2. Jennifer Niederst Robbins "Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics," O'Reilly.
3. DT Editorial Services, "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)," 2nd Edition, Dreamtech Press.

Reference Books:

1. Marty Hall, Larry Brown, "Core Web Programming", Second Edition, Pearson Education.
2. H.M. Deitel, P.J. Deitel and A.B. Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education.
3. Chris Bates, "Web Programming Building Internet Applications", 3rd Edition, Wiley India.
4. Xue Bai et al, "The web Warrior Guide to Web Programming", Thomson.

E-Resources:

MOOC / NPTEL/YouTube Links:

1. http://www.nptelvideos.in/2012/11/internet-technologies.html
2. https://freevideolectures.com/course/2308/internet-technology/25video lecture by Prof. Indranil Sengupta, IIT, Kharagpur
3. https://www.digimat.in/nptel/courses/video/106105191/L01.html
4. https://www.w3schools.com/html/html_blocks.asp
5. https://www.javatpoint.com/html-frame-tag

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)								**Semester:** I	
Course: Professional Development – I								**Code:** ADCC101	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	04	-	02	-	-	50	-	-	50

Course Objectives:

1. To introduce students on professional development skills and its importance in building personal and professional life.
2. To bring in self-awareness and realization of Values, Self-discipline and self-grooming for betterment of life and contribution to our Society.

Course Outcomes: After completion of this course, students will be able to -

CO1	Know their own values and how to use in their career and personal life.
CO2	Understand the importance of self-discipline and how it can empower individuals to take control of their actions and decision in any situation.
CO3	Know the importance of self-grooming to maintain good health and self-confidence.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Values:** Understand, Know, Define and Use of your Values, Types of Values, Internal and External Stakeholders, What is SWOT analysis and how to do, Action planning and execution, Self-review.	24
2.	**Self-discipline:** Definition, Self-discipline impact in your life and society, Techniques to build self-discipline, Self-review and actions.	16
3.	**Self-grooming:** What is personal grooming and its importance, Making Self-care guide and practice, Self-care for health and well-being.	16
	TOTAL	**56**

Text Books:

1. R. Srinivasan, "Strategic Management: Text and Cases", PHI Publication.
2. M. K. Sinha, "Success Through Self-Discipline: Your Personal Guide to Achieving Your Goals".

Reference Books:

1. Stephen R. Covey, "The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change", Simon & Schuster, 1989.
2. Jack Canfield, "The Success Principles", HarperCollins, 2005.
3. Norman Vincent Peale, "The Power of Positive Thinking", Prentice Hall, 1952.

E-Resources:

1. Coursera: "The Science of Well-Being" by Yale University, - https://www.coursera.org/learn/the-science-of-well-being
2. Udemy: "Self-Care: Take Care of Yourself to Better Take Care of Others" by Jessica Rogers https://www.udemy.com/course/caring-self/?couponCode=UPGRADE02223

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech (Artificial Intelligence And Data Science)							**Semester:** I		
Course: Liberal Learning – I (Guitar)							**Code:** ADCC102A		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Guitar musical instrument.

Course Objectives:

1. To build a strong foundation in Indian classical dance through mastering basic techniques, rhythms, expressions, and repertoire, culminating in a performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Illustrate the fundamental aspects of Guitar instrument.
CO2	Demonstrate the performance of Guitar Instrument.
CO3	Apply different types Chords.
CO4	Apply basic outline through various prescribed ragas practically.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to the Guitar	2
2.	Understanding standard tuning	2
3.	Introduction to tablature and note reading	2
4.	Introduction to basic music theory concepts	2
5.	Understanding scale, intervals, and chords	2
6.	Learning more open chords: D major, D minor, C major, G major	2
7.	Understanding power chords and their shapes	2
8.	Understanding barre chord shapes: F major, B minor	2
9.	Finding Chords by Ear	2
10.	Chord Progressions	2
11.	Advanced Chord Types	2
12.	Transposing Chord	2
13.	Review and Practice	2
14.	Introduction to Scales	2
	TOTAL	**28**

Text Books:

1. David Hodge, "Guitar Theory", DK Publishing.

Reference Books:

1. Russ Shipton, "The Complete Guitar Player", Published by Wise.
2. Vincent Ong, Alfred Khp," Classical Guitar Advanced Studies Repertoires", Dynamic Publication.

E-Resources:

1. https://www.youtube.com/watch?v=BBz-Jyr23M4

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech (Artificial Intelligence And Data Science)							**Semester:** I		
Course: Liberal Learning – I (Singing)							**Code:** ADCC102B		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music in singing.

Course Objectives:

1. To offer students' knowledge of the basic concepts of Singing in a very easy to understand manner with their practical applicability.

Course Outcomes: After completion of this course, students will be able to -

CO1	Illustrate the fundamental aspects of Singing.
CO2	Demonstrate the performance of Singing.
CO3	Apply basic outline through various prescribed ragas practically.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Voice Culture in Indian Semi Classical Singing.	2
2.	Basics of Singing o Introduction to semi classical singing.	2
3.	Basics of Indian Semi Classical Music.	2
4.	Learning Basic Ragas.	2
5.	Music Theory Basics.	2
6.	Vocal Warm-ups.	2
7.	Introduction to Ear Training.	2
8.	Breathe Control.	2
9.	Resonance and Tone Production.	2
10.	Diction and Articulation.	2
11.	Dynamics and Expression.	2
12.	Introduction to Repertoire.	2
13.	Practice Techniques.	2
14.	Interpretation and Expression.	2
	TOTAL	**28**

Text Books:

1. Dr. Theodore Dimon, "Anatomy of the Voice, This Is a Voice".

Reference Books:

1. Richard Miller, "The Structure of Singing", Schirmer Books, London.
2. Jennifer Hamady, "The Art of Singing", Published by Hal Leonard.

E-Resources:

1. https://www.youtube.com/watch?v=4hNq9qykOyE
2. https://www.youtube.com/watch?v=b14gkmECz-Y

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech (Artificial Intelligence And Data Science)							**Semester:** I		
Course: Liberal Learning – I (Cinematography)							**Code:** ADCC102C		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.

Course Objectives:

1. To make students effectively use their camera's components, study fundamental photography techniques and apply basic to advanced editing skills.

Course Outcomes: After completion of this course, students will be able to -

CO1	Illustrate the fundamental aspects of camera equipment.
CO2	Demonstrate the performance of camera equipment
CO3	Ability to translate creative concepts into visually engaging and coherent film or video projects.
CO4	Mastery in crafting compelling visual narratives through camera angles, lighting, and composition

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to Photography	2
2.	Understanding camera components (lens, shutter, sensor)	2
3.	Exposure Triangle	2
4.	Introduction to the rule of thirds, leading lines, and framing	2
5.	Understanding autofocus vs. manual focus	2
6.	Introduction to natural and artificial lighting	2
7.	White Balance and Color Theory	2
8.	Motion and Long Exposure	2
9.	Basics of portrait photography	2
10.	Basics of landscape photography	2
11.	Overview of post-processing software (e.g., Adobe Light room, Photoshop)	2
12.	Introduction to advanced editing tools	2
13.	Organizing and Storing Photos	2
14.	Final Project Presentation and Review	2
	TOTAL	**28**

Text Books:

1. Tania Hoser, "Introduction to Cinematography", Taylor & Francis.

Reference Books:

1. Anat Pick, "Screening Nature", Berghahn Books.
2. Blain Brown, "Cinematography: Theory and Practice", Taylor & Francis.

E-Resources:

1. https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRbxKOm
2. https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech (Artificial Intelligence And Data Science)								**Semester:** I	
Course: Liberal Learning – I (Dance)								**Code:** ADCC102D	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.

Course Objectives:

1. To build a strong foundation in Indian classical dance through mastering basic techniques, rhythms, expressions, and repertoire, culminating in a performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Understand the fundamental postures, hand gestures and basic steps of Indian classical dance.
CO2	Understand and perform dance sequences to various rhythmic cycles (Tala) with confidence.
CO3	Convey emotions and stories through facial expressions (Abhinaya) and body language.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Overview of Indian Classical Dance	2
2.	Fundamental Postures and Hand Gestures (Hasta Mudras)	2
3.	Introduction to Basic Steps (Adavus or Tatkars)	2
4.	Rhythmic Patterns and Clapping (Tala)	2
5.	Advanced Basic Steps	2
6.	Strength and Conditioning	2
7.	Introduction to Basic Expressions (Abhinaya)	2
8.	Integrating Steps and Expressions	2
9.	Intermediate Rhythmic Patterns	2
10.	Improvisation and Creative Movement	2
11.	Introduction to Advanced Movements	2
12.	Review and Feedback	2
13.	Learning a Simple Dance Piece - Part 1	2
14.	Learning a Simple Dance Piece - Part 2	2
	TOTAL	**28**

Text Books:

1. Padma Subrahmanyam, "Indian Classical Dance: A Beginner's Manual", Abhinav Publications.

Reference Books:

1. Dr. Aditi Sriram, "Indian Classical Dance: A Guide", Vikas Publishing House.

E-Resources:

1. https://youtu.be/5apCTHzvkWI?si=p11CR_4XxPocTbjO
2. https://youtu.be/OIKOHzePJCA?si=7pnPZKuvfT5EIWhf

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech (Artificial Intelligence And Data Science)							**Semester:** I		
Course: Liberal Learning – I (Synthesizer/Keyboard)							**Code:** ADCC102E		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Keyboard musical instrument.

Course Objectives:

1. To offer students' knowledge of the basic concepts of playing Keyboard in a very easy to understand manner with their practical applicability.

Course Outcomes:

CO1	Illustrate the fundamental aspects of Keyboard instrument.
CO2	Demonstrate the performance of Keyboard Instrument.
CO3	Apply different types of Chords.
CO4	Apply basic outline through various prescribed ragas practically.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to the Keyboard	2
2.	Understanding Notes and Keys	2
3.	Basic Music Theory	2
4.	Introduction to the C major scale	2
5.	Learning to play simple melodies in C major	2
6.	Introduction to Chords	2
7.	Combining Melodies and Chords	2
8.	Review and practice melodies and chords	2
9.	Introduction to Minor Scales	2
10.	Introduction to additional chords (D major, E minor)	2
11.	Understanding chord progressions (e.g., I-IV-V)	2
12.	Review scales, chords, and progressions	2
13.	Introduction to Arpeggios	2
14.	Dynamics and Expression	2
	TOTAL	**28**

Text Books:

1. Chuan C. Chang, "Fundamentals of Piano Practice", Create space Independent Publishing Platform.

Reference Books:

1. Michael Rodman, "Keyboard for the Absolute Beginners", Alfred Publishing.
2. Davis Dorrough, "Piano Scales".

E-Resources:

1. https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH
2. https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech (Artificial Intelligence And Data Science)							**Semester:** I		
Course: Liberal Learning – I (Basketball)							**Code:** ADCC102F		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop foundational basketball skills, including dribbling, passing, shooting, and defense, while understanding game rules and strategies through practical gameplay and scrimmage.

Course Outcomes: After completion of this course, students will be able to -

CO1	Demonstrate basic basketball skills such as dribbling, passing, shooting, and defensive fundamentals effectively.
CO2	Apply offensive and defensive strategies, including transition play, during gameplay and scrimmages.
CO3	Understand and implement basketball game rules and referee gestures accurately in practical situations.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to Basketball	2
2.	Basic Skills – Dribbling	2
3.	Basic Skills- Passing	2
4.	Basic Skills- Shooting	2
5.	Defensive Fundamentals	2
6.	Rebounding Basics	2
7.	Ball Handling & Control	2
8.	Shooting Mechanics	2
9.	Offensive Strategies	2
10.	Defensive Strategies	2
11.	Transition Play	2
12.	Gameplay & Scrimmage	2
13.	Game Rules , Refree Gestures	2
14.	Practical	2
	TOTAL	**28**

Text Books:

1. K.K. Sharma, "Basketball: Skills and Drills", Sports Publications.

Reference Books:

1. Dr. P.K. Kher, "Basketball Coaching: A Complete Guide", Khel Prakashan.
2. S. Reddy, "The Ultimate Guide to Basketball Training", Blue Rose Publisher.

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech (Artificial Intelligence And Data Science)								**Semester:** I	
Course: Liberal Learning – I (Cricket)								**Code:** ADCC102G	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To enhance cricket skills from basics to advanced techniques, focusing on tactics, fitness, and specialized fielding and wicket keeping through targeted practice and match simulations.

Course Outcomes: After completion of this course, students will be able to -

CO1	Master fundamental and advanced cricket techniques, including batting, bowling, and specialized fielding and wicket keeping.
CO2	Demonstrate an understanding of game scenarios and tactical strategies, applying them effectively during match simulations and pressure situations.
CO3	Improve physical fitness, strength, and conditioning, with targeted skill enhancement and mid-season assessments to track progress.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction and Fundamentals.	2
2.	Basic Techniques.	2
3.	Introduction to Game Scenarios.	2
4.	Physical Fitness and Match Simulations.	2
5.	Advanced Batting Techniques	2
6.	Advanced Bowling Techniques	2
7.	Specialized Fielding and Wicket keeping	2
8.	Tactical Understanding	2
9.	Refining Batting Techniques	2
10.	Refining Bowling Techniques	2
11.	Fielding Under Pressure	2
12.	Strength and Conditioning	2
13.	Targeted Skill Improvement	2
14.	Mid-Season Assessment	2
	TOTAL	**28**

Text Books:

1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press

Reference Books:

1. Sachin Tendulkar, "Playing It My Way", Hachette India
2. Rahul Dravid, "Cricket: The Game of Life", Penguin India

E-Resources:

1. Sports and Performance Nutrition, IIT Madras, https://onlinecourses.nptel.ac.in/noc24_hs82/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech (Artificial Intelligence And Data Science)						**Semester:** I			
Course: Liberal Learning – I (Rifle and Pistol Shooting)						**Code:** ADCC102H			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop fundamental skills in rifle and pistol shooting through technical knowledge, practical drills, and mental preparation for competitive performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Master fundamental and advanced shooting techniques for both rifle and pistol, including aiming, breathing, and triggering.
CO2	Develop strong mental focus and relaxation techniques essential for high-performance shooting and competition readiness.
CO3	Gain hands-on experience in live shooting drills and positional shooting, preparing them for competitive shooting scenarios.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction about shooting game	2
2.	Basic technical knowledge	2
3.	Technique Refinement(aiming, breathing and triggering)	2
4.	Learning about live shooting and technics	2
5.	Practicing standard Positional rifle Shooting	2
6.	Mental Preparation and Focus	2
7.	Practice and learning session of live shooting(rifle)	2
8.	Learning about pistol shooting(pistol)	2
9.	Introduction of pistol positions and dry practice	2
10.	Practical Shooting Drills (basic)	2
11.	Learning about live shooting and technics(standing position)	2
12.	Learning of Concentration, breathing and relaxing exercise for shooting	2
13.	Introduction of competition level and practice	2
14.	Final test and oral (rifle and pistol match)	2
	TOTAL	**28**

Reference Books:

1. David Watson, "ABCs of Rifle Shooting", Gun Digest (Imprint of KP Books), 2014

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech (Artificial Intelligence And Data Science)							**Semester:** I		
Course: Liberal Learning – I (Volleyball)							**Code:** ADCC102I		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop foundational volleyball skills, including serving, passing, setting, spiking, and blocking, while mastering game rules and strategies through practical gameplay and scrimmage.

Course Outcomes: After completion of this course, students will be able to -

CO1	Demonstrate proficiency in basic volleyball skills such as serving, passing, setting, spiking, and blocking.
CO2	Apply offensive and defensive strategies effectively, including serve receive and transition play, during gameplay.
CO3	Understand and implement volleyball rules and referee gestures, applying them accurately during practical gameplay and scrimmages.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to Volleyball	2
2.	Basic Skills - Serving	2
3.	Basic Skills- Passing	2
4.	Basic Skills- Setting	2
5.	Spiking Basics	2
6.	Blocking Basics	2
7.	Digging Basics	2
8.	Serve Receive	2
9.	Offensive Strategies	2
10.	Defensive Strategies	2
11.	Transition Play	2
12.	Gameplay & Scrimmage	2
13.	Game Rules , Refree Gestures	2
14.	Practical	2
	TOTAL	**28**

Text Books:

1. Jitendra Kumar, "The Complete Guide to Volleyball", Blue Rose Publisher

Reference Books:

1. N. Ramachandran, "Volleyball: Steps to Success", Sports Publication

E-Resources:

1. https://coachtube.com/course/volleyball/volleyball-for-beginners/7004

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** I		
Course: Liberal Learning – I (Football)							**Code:** ADCC102J		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To enhance players' technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.

Course Outcomes: After completion of this course, students will be able to -

CO1	To identify and describe the fundamental skills and strategies involved in football, including ball control, dribbling techniques, basic offensive and defensive tactics.
CO2	To apply advanced dribbling and passing techniques during practice sessions.
CO3	To design and execute a cohesive game plan that integrates set pieces, team chemistry, and communication, evaluating its effectiveness through simulation matches.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction and Basic Skills.	2
2.	Ball Control and Movement.	2
3.	Advanced Dribbling and Passing.	2
4.	Shooting and Finishing.	2
5.	Offensive Tactics.	2
6.	Defensive Tactics.	2
7.	Set Pieces (Offensive and Defensive).	2
8.	Team Chemistry and Communication.	2
9.	Midfield Dominance.	2
10.	Forward Play and Creativity.	2
11.	Defense Organization.	2
12.	Goalkeeper Training.	2
13.	Speed and Agility.	2
14.	Simulation Matches.	2
	TOTAL	**28**

Text Books:

1. Srinivasan J. B, "Football Coaching: A Comprehensive Guide", Sports Publishing.

Reference Books:

1. Rob Ellis, "The Complete Guide to Coaching Soccer", Meyer & Meyer Sport.

E-Resources:

1. Udemy – Soccer Courses - https://www.udemy.com/topic/soccer/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** I		
Course: Indian Knowledge System and Financial Literacy							**Code:** ADIK101		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	-	-	50

Prerequisites:

Basic knowledge of algebra and mathematical operations.

Course Objectives:

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of Indian Knowledge System.
2. To make students proficient in fundamental financial concepts essential for managing personal finances effectively.
3. To equip students with practical budgeting skills to empower them to achieve financial independence.

Course Outcomes: After completion of this course, students will be able to -

CO1	Understand IKS fundamentals, Indian numeral system, and key contributions in mathematics and measurement.
CO2	Recognize metal working techniques, Vastushastra principles, historical engineering and architecture practices.
CO3	Understand financial concepts, money types, bank accounts, and essential financial terms for practical application.
CO4	Manage budgets, credit, loans, and develop financial plans for career and education goals.
CO5	Understand various investments, risk management, insurance types, and develop retirement planning strategies.
CO6	Comprehend tax forms, compliance, fraud protection, and financial considerations for investments and business.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Foundations of Indian Knowledge System:** Definition and scope of IKS, Historical development and significance. **Number System and Units for Measurement**: Salient features of the Indian numeral system, The discovery of zero and its importance, Decimal Systems, Measurement of time, distance and weight. **Mathematics**: Unique aspects of Indian mathematics, Great mathematicians and their significant contributions in the area of arithmetic, algebra, geometry, trigonometry, binary mathematics.	5
2.	**Application of Indian Knowledge System:** Metals and Metal Working: Mining and ore extraction, Extraction of iron from Biotite by indigenous techniques, Lost wax casting of idols and artefacts, Architecture and Structures: Vastushastra, Unitary buildings and Town planning, Temple architecture. Physical structures in India, Irrigation and water management	5

3.	**Finance:** Importance of Financial Literacy for Engineers, Understanding Money, Types of Money- Cash, Cheque, UPI Payment, Digital Currency, etc Types of bank accounts - saving, salary, current, loan, etc., Basic financial Terms- Income, Expenditure, Balance, saving, loan, interest rates, compound interest rate, credit, Investment, Taxes	4
4.	**Financial Planning:** Personal budgeting, Understanding debit and credit card, credit score, Types of credit card, credit card payment cycle, Barrowing, Loans / Debts, Types of loans, Terms of barrowing, Loan, Interest rate, Principal, EMI, EMI Calculation, Repayment of loan/debt strategy, Financial Planning for Career Development, Higher studies,	5
5.	**Investment and Wealth Management:** Basics of Investing, Effect of compounding, Types of Investment (fixed deposit, recurring deposits, Insurance policies, Bonds, Mutual Funds, Stocks, real estate, etc.) Risk and Return, Concept of SIP, STP and SWP, Stock Market, Stock Exchanges, reading of stock market indices, Life insurance, healthcare insurance, vehicle insurance, Importance of early retirement planning, Investment strategy, Pension Plan, Portfolio management,	5
6.	**Finance Compliance:** Types of Taxes, Types of Income Tax return form and Filling, Taxes and reforms, Impact of taxation policy on Investment, Scams and Frauds, Protection of personal information, Financial consideration for starting business, Real estate and purchase	4
	TOTAL	**28**

Text Books:

1. B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pawana R. N., "Introduction to Indian Knowledge System – Concepts and Applications", PHI Learning Pvt. Ltd., New Delhi.
2. Dr. Babu V., Mr. Mohammed Umair, "Financial Literacy", Himalaya Publishing House, First Edition.

Reference Books:

1. A. K. Bag, "History of Technology in India", Vol. I, Indian National Science Academy, New Delhi.
2. Dr. S. Gurusamy, "Indian Financial System", Tata McGraww-Hill Education Pvt. Ltd 2nd Edition.
3. D.N. Bose, S.N. Sen and B. V. Subbarayappa, "A Concise History of Science in India", Indian National Science Academy, New Delhi.

E-Resources:

1. SWAYAM - "Indian Knowledge System(IKS): Concepts and Applications in Engineering", Indian Institute of Management Bangalore (IIMB), Chanakya University, Bangalore. https://onlinecourses.swayam2.ac.in/imb23_mg53/preview
2. SWAYAM - "Introduction to Banking and Financial Markets", Indian Institute of Management Bangalore (IIMB), - https://onlinecourses.swayam2.ac.in/imb23_mg14/preview
3. Online free course on "Financial Literacy" by Khan Academy. https://www.khanacademy.org/college-careers-more/financial-literacy/xa6995ea67a8e9fdd:welcome-to-financial-literacy

SYLLABUS

SEMESTER - II

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)								**Semester:** II	
Course: Probability and Statistics								**Code:** ADBS203	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

Prerequisites:

Knowledge of basic calculus.

Course Objectives:

1. To understand the fundamental concepts of statistics and sampling theory, including their origins, definitions, and importance.
2. To learn about measures of central tendency and their relevance in describing data distributions.
3. To understand the concepts of dispersion, skewness, and kurtosis, and their significance in data analysis.
4. To gain a foundational understanding of probability theory, including basic definitions, laws, and concepts.
5. To understand the concepts of discrete and continuous random variables, probability mass and density functions, and distribution functions, and apply them to solve probability problems.
6. To introduce students to understand, explain, and apply the foundational mathematical concepts at the core of computer science.

Course Outcomes: On completion of the course, learner will be able to -

CO1	Develop skills to apply various sampling methods and understand their implications on data analysis.
CO2	Acquire the ability to analyze frequency distributions, construct histograms and frequency polygons.
CO3	Develop proficiency in calculating and interpreting measures of dispersion
CO4	Apply probability principles to analyze random experiments.
CO5	Understand the concepts of discrete and continuous random variables, probability mass and density functions.
CO6	Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Statistics and Sampling Theory:** Statistics: Introduction, Origin and Development of Statistics, Definition, Importance and Scope, Limitations, Distrust of Statistics. Sampling, Introduction, Types of sampling, Purposive sampling, Random sampling, simple sampling, stratified sampling, parameter and statistics, sampling distribution.	7

2.	**Descriptive Statistics: Measures of Central Tendency:** Frequency Distributions and Measures of central Tendency: Frequency Distribution, Continuous Frequency Distribution, Graphic Representation of a Frequency Distribution, Histogram, Frequency Polygon, Averages or Measures of Central Tendency or Measures of Location, Requisites for an Ideal Measure of Central Tendency, Arithmetic Mean, Weighted Mean, Median, Mode, Harmonic Mean.	7
3.	**Descriptive Statistics: Measures of Dispersion:** Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Standard Deviation and Root Mean Square Deviation, Coefficient of Dispersion, Coefficient of Variation Skewness and Kurtosis, Skewness, Kurtosis, correlation and regression.	7
4.	**Introduction to Probability Theory:** Definition of a probability experiment and sample space. Outcomes, events, and their probabilities. Laws of probability: addition rule, multiplication rule, and complement rule. Axioms of probability Conditional Probability, Baye's theorem.	7
5.	**Random Variables:** Random Variable, Distribution Function, Properties of Distribution Function, Discrete Random Variable, Probability Mass Function, Discrete Distribution Function, Continuous Random Variable, Probability Density Function Probability distribution: Binomial, Poisson, Normal.	7
6.	**Application of statistics in Artificial Intelligence:** Application-Foundation for Analysis, Performance Metrics in Machine Learning, Extracting Insights, Identifying Patterns, Optimization Algorithms: Case Studies: Analyzing Customer Behavior, Designing AI Chips, Healthcare Predictive Analytics, Financial Forecasting.	7
	TOTAL	**42**

Text Books:

1. Hossein Pishro-Nik, "Introduction to Probability, Statistics, and Random Processes," Pearson, 2014.
2. Morris H. DeGroot and Mark J. Schervish, "Probability and Statistics," Addison-Wesley, 2012.
3. David S. Moore, George P. McCabe, and Bruce A. Craig, "Introduction to the Practice of Statistics," W.H. Freeman, 2018.
4. C. L. Liu, "Elements of Discrete Mathematics," TMH, 2000.

Reference Books:

1. Geoffrey R. Grimmett and David R. Stirzaker, "Probability and Random Processes," Oxford University Press, 2001.
2. Roy D. Yates and David J. Goodman, "Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers," Wiley, 2005.
3. George Casella and Roger L. Berger, "Statistical Inference," Cengage Learning, 2002.

E-Resources:

1. An Introduction to Statistical Learning by Gareth James
   https://www.ime.unicamp.br/~dias/Intoduction%20to%20Statistical%20Learning.pdf
2. NPTEL Course: "Introduction To Probability Theory And Statistics"
   https://onlinecourses.nptel.ac.in/noc22_ma81/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)								**Semester:** II	
Course: Engineering Physics								**Code:** ADBS204	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	02	-	03	40	60	25	-	-	125

Prerequisites:

Fundamentals of Physics, basic of interference, polarization, de-Broglie hypothesis, semiconductor and ultrasonic.

Course Objectives:

1. To make the students understand and study the basic principles of Physics.
2. To provide firm grounding to the students in the concept of physics to resolve many engineering and technological problems.
3. To impart the knowledge of the fundamentals of physics to the students through hands on experiments and extend it to relevant engineering applications.

Course Outcomes: After completion of this course, students will be able to -

CO1	Explain basics of interference and polarization connected to engineering applications.
CO2	Make use of Laser technology and Optical fiber in various disciplines.
CO3	Outline the fundamentals of Quantum Physics and relate it to engineering applications.
CO4	Apply basics of semiconductors for solving the engineering problems.
CO5	Extend the understanding of Ultrasonic and NDT in engineering.
CO6	Interpret the use of nanoparticles and superconductors in the field of engineering.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Wave Optics:** **Units and its conversion-**Length, Mass, Velocity, Acceleration Momentum, Time, Temperature, Wavelength, Energy, Current, Voltage, Power, Intensity, Amplitude, Frequency, Pressure, Resistance, compressibility, resistivity, conductivity, Mobility, Angle. **Interference-** Interference in thin film of uniform thickness and its conditions (Simple Numerical), Engineering Applications – Ant-Reflection coating (ARC). **Polarization**- Polarization and its types, Malus law and Brewster's law (Simple numerical), Double refraction, Huygens's theory of double refraction, Differentiate between positive & negative crystal, Engineering applications of polarization: Liquid Crystal Display (LCD).	5
2.	**Laser and Optical Fiber:** **Laser**- Basic Principles of laser, Elements of Laser, Characteristics of laser, He-Ne laser (Gas laser), Applications of laser – Medical, Industrial and Holography- Recording. **Optical fibers-** Propagation of light - Acceptance angle, Acceptance cone, Numerical aperture, Fractional Refractive Index Change (Simple numerical).	5

	Types of optical fibers, Advantages of optical fiber communication, Applications of optical fiber in Medical, Communication, Entertainment, Data Security.	
3.	**Quantum Physics:** de-Broglie hypothesis of matter waves, de-Broglie wavelength for a particle accelerated by Kinetic Energy (K.E) and a charged particle accelerated by Potential difference (PD) "V", (Simple Numerical), Properties of matter waves, Heisenberg's uncertainty principle for wide wave packet and narrow wave packet (Simple Numerical), Tunneling Effect, Engineering applications - Scanning Tunneling Microscope (STM), Introduction to Quantum Computing.	4
4.	**Semiconductor Physics:** Classification of solids on the basis of band theory, Fermi level for metal and semiconductor, Position of Fermi level in extrinsic semiconductors (only diagram), Solar cell: principle, working, IV-characteristics, Efficiency and fill factor, Factor to improve efficiency of solar cell, Application, advantages and disadvantages of solar cell, Hall effect: derivation for Hall voltage and Hall coefficient (Simple numerical).	5
5.	**Ultrasonic and Non-destructive Testing:** **Ultrasonic**- Properties of ultrasonic waves, Piezoelectric effect and inverse of piezoelectric effect, Generation of ultrasonic waves by inverse piezoelectric effect (using transistor), Compressibility of liquid by using ultrasonic waves (Simple Numerical). **Non- Destructive Testing (**NDT): Definition and its objectives, Difference between destructive testing and non-destructive testing, Application of NDT as an Ultrasonic flaw detection technique (Simple numerical), Advantages of NDT.	4
6.	**Nanophysics and Superconductivity:** **Nanophysics-** Introduction of nanophysics, Properties of nanoparticles (Optical, Electrical, Mechanical), Applications of nanomaterials in Electronics, Automobile, Medical. **Superconductivity-** Definition of superconductivity on the basis of temperature dependence of resistivity, Properties of Superconductors, Meissner effect, Critical magnetic field (Simple Numerical), Type I and Type II Superconductors, Engineering applications of superconductivity in Superconducting Quantum Interface Device (SQUID) with its principle, working, general application of superconductors - Power Transmission, electronics, medical, principle of Maglev train.	5
	TOTAL	**28**

List of Experiments:

Perform any 08 experiment out of 12:

1. Experiment based on Newton's rings (determination of wavelength of monochromatic light, determine radius of curvature of Plano-convex lens).
2. Experiment based on polarization (To verify Law of Malus).
3. Determination of refractive index using Brewster's law.
4. Experiment based on Double Refraction (Determination of refractive indices / Identification of types of crystal).

5. Experiment based on Laser (Determination of thickness of wire / Number of lines on grating surface).
6. Determination of Planck's constant using available experimental setup.
7. To study IV characteristics of Solar Cell and determine parameters (fill factor and efficiency).
8. To determine Hall coefficient and charge carrier density.
9. Determination of velocity of ultrasonic waves and compressibility of given liquid by using Ultrasonic Interferometer.
10. An experiment based on optical fiber. (To determine the numerical aperture acceptance angel acceptance cone of optical fiber of laser diode.
11. Experiment based on semiconductor (To determine the temperature dependence characteristics of semiconductor).
12. To determine the unknown wavelength by using plane diffraction grating.
13. Study visit to research laboratory/ facility and submit report **(Compulsory).**

Text Books:

1. M. N. Avadhanulu and P.G. Kshirsagar, "Engineering Physics", S. Chand Publications.
2. S. O. Pillai, "Solid State Physics", New age International Publications.
3. J. J. Sakurai, "Modern Quantum Mechanics", Pearson Publication.
4. V K Mehta and Rohit Mehta, "Basic Electrical Engineering", S Chand Publications.
5. Robert L. Jaffe and Washington Tayler, "The Physics of Energy", Cambridge University Press".

Reference Books:

1. H. D. Young and R. A. Freedman, "University Physics", Pearson Publication.
2. Resnick and Halliday, "Principles of Physics", John Wiley and Sons.
3. Jenkins and White, "Optics", Tata McGraw Hill.
4. Noson S. Yanofsky and Mirco A. Mannucci, "Quantum computing for computer scientists", Cambridge University Press

E-Resources:

1. NPTEL Course:
   a) NPTEL lecture based on interference of polarized light by IIT Roorkee - https://youtu.be/e-4QK_JVsdU?si=gWIBt41dDgeABO8Y
   b) NPTEL lecture based on Introduction of Polarization by IIT Roorkee- https://youtu.be/fIVlzKB4bBQ?si=meWFP5matsopCABi
   c) NPTEL lecture based on Malus Law by IIT Roorkee https://youtu.be/iFG82I3nFA0?si=JCln6fJqGNw6ix5U
   d) NPTEL lecture based on Double Refraction by IIT Roorkee https://youtu.be/Pt5wvYyguq0?si=4mowxORZQXGXNxMW
   e) NPTEL lecture based on Semiconductor Physics by IIT Roorkee - https://youtu.be/q7VIITSysMs?si=62lAMoJ2tMHKRiDH
   f) NPTEL lecture based on Introduction to superconductivity https://youtu.be/hGPA1g8fKug?si=FdYfJju6bf6u2zRe
   g) NPTEL lecture based on Meissner Effect- https://youtu.be/EkNnxBakJMs?si=qRnSvPlD2NTe4rf-

2. Feynman lecture series: https://www.feynmanlectures.caltech.edu/
3. Concepts of Modern Physics, Arthur Beiser: - https://nitsri.ac.in/Department/PHYSICS/Beiser_Modern_Physics.pdf
4. Lectures by Walter Lewin: https://www.youtube.com/channel/UCiEHVhv0SBMpP75JbzJShqw
5. Quantum Mechanics Lecture Series by Prof. H.C.Verma - https://www.youtube.com/watch?v=JFWuAQRZPjQ&list=PLWweJWdB_GuISnGkAafMpzzDBvTHg02At
6. Virtual Labs, Amrita University- https://vlab.amrita.edu/?sub=1&brch=195
7. Virtual Labs, IIT Kanpur- https://bop-iitk.vlabs.ac.in/exp/energy-band-gap/simulation.html

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Fundamentals of Computer Systems and Networking							**Code**: ADES203		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	02	-	03	40	60	25	-	-	125

Prerequisites:

Basic knowledge of computers and binary systems.

Course Objectives:

1. To understand the architecture and functioning of computer systems.
2. To explore fundamental networking concepts and technologies.
3. To develop foundational knowledge of operating systems and computer organization.
4. To learn about various networking models, protocols, and data communication methods.
5. To understand the role of hardware and software in computing and networking.

Course Outcomes: After completion of this course, students will able to -

CO1	Understand the basic components and organization of a computer system and the role of operating systems in managing hardware and software.
CO2	Gain insights into the organization and architecture of a computer, including CPU functioning and memory hierarchy.
CO3	Understand basic networking concepts, data communication modes, network topologies, and the types of networks.
CO4	Describe the OSI and TCP/IP models, along with understanding key networking protocols and addressing techniques.
CO5	Understand the basic concepts of network security, including encryption, firewalls, and security protocols to protect communication.
CO6	Explore the emerging trends in computer systems and networking, including cloud computing, IoT, and advancements in network technologies

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Computer Systems:** Overview of Computers: History of computers (evolution and key milestones), Types of computers: Analog, Digital, And Hybrid. Applications of Computers: In education, healthcare, business, entertainment, and other fields. Components of a Computer System: Hardware vs. Software, Basic hardware components (CPU, memory, storage, input/output devices). Introduction to Operating Systems: Functions (process, memory, file system, device management), Types (batch, time-sharing, real-time, distributed, embedded), Structure (Kernel, Shell, System Utilities).	4
2.	**Computer Architecture and Organization:** Basic Structure of a Computer: Von Neumann architecture, instruction cycle.	4

	CPU Organization: ALU, Registers, Control Unit. Buses and Interfacing: Overview of data transfer methods (bus organization, control lines). Memory Architecture: Memory hierarchy, RAM, ROM, Cache, Virtual Memory. I/O Systems: I/O devices, I/O addressing, and basic concepts of interrupts and DMA. Display Technologies: Explore different display types (CRT, LCD, LED), display technology fundamentals, resolution, and refresh rate	
3.	**Data Communication and Networking Fundamentals:** Data Communication: Types of data transmission, Modes (Simplex, Half-duplex, Full-duplex), Transmission media (Wired, Wireless) Network Topologies: Bus, Star, Ring, Mesh, Hybrid. Types of Networks: LAN, WAN, MAN, PAN. Overview of Networking Devices: Switches, Routers, Modems, Hubs, Repeaters Introduction to the Internet: Basics of how the internet works, Internet protocols	5
4.	**Networking Models and Protocols:** OSI Model: Layers and functions. TCP/IP Model: Layers and comparison with OSI. IP Addressing: IPv4, IPv6, Subnetting, CIDR. Network Protocols: HTTP, FTP, SMTP, DNS, DHCP, ICMP. Packet Switching vs. Circuit Switching: Fundamental differences and use cases.	5
5.	**Introduction to Network Security:** Fundamentals of Network Security: Threats, Attacks, Vulnerabilities. Cryptography Basics: Symmetric and Asymmetric Encryption, hashing. Firewalls and Intrusion Detection Systems (IDS): Working principles of firewalls and intrusion detection systems. Security Protocols: SSL/TLS, IPSec, VPN. Authentication and Access Control**:** Overview of methods such as passwords, biometrics, multi-factor authentication.	5
6.	**Emerging Trends in Computer Systems and Networking:** Cloud Computing**:** Basics, service models (IaaS, PaaS, SaaS), deployment models (public, private, hybrid). Virtualization**:** Concept of virtual machines, hypervisors. Internet of Things (IoT): Architecture, Applications, Challenges. 5G Networking: Features, use cases, and its role in modern communications. Edge and Fog Computing: Concepts and Applications. Data Centers: Fundamentals, architectures, and their role in modern computing.	5
	TOTAL	**28**

List of Experiments:

Group A: Fundamentals of Computer Systems: (Any 8)

1. Disassemble and identify key components of a computer system (CPU, RAM, motherboard, storage, etc.). Discuss functionalities and basic maintenance practices.
2. Use a simulator to demonstrate the instruction execution process in a CPU and explore the memory hierarchy (RAM, cache, virtual memory). **Open-source software**: SimulIDE, Little Man Computer Simulator.
3. Create a diagram of a motherboard, labeling key components (CPU socket, RAM slots, expansion slots, connectors) and explaining their functions. **Open-source software**: Dia, Fritzing.
4. Install and configure an expansion card (e.g., graphics card or network card) in a computer.
5. Compare HDD and SSD by conducting performance tests (e.g., read/write speed tests). **Open-source software**: CrystalDiskMark, KDiskMark (Linux)

6. Install an operating system (e.g., Windows, Linux) on a computer. **Open-source software**: Ubuntu, Fedora.
7. Benchmark a GPU using a graphics-intensive application and analyze its performance. **Open-source software**: Unigine Heaven Benchmark, GLMark2
8. Compare different display technologies (CRT, LCD, LED) in terms of resolution, refresh rate, and overall quality.
9. Diagnose and resolve a hardware or software problem in a computer system. **Open-source software**: HWiNFO, Speccy.
10. Install and configure antivirus software, demonstrating its features. **Open-source software**: ClamAV.

Group B: Fundamentals of Networking: (Any 5)

1. Set up a small LAN and demonstrate data transfer between devices. **Open-source software**: Wireshark, EtherApe
2. Configure a switch and a router for a network, demonstrating their roles in data communication. **Open-source software**: Cisco Packet Tracer, GNS3.
3. Simulate data transfer using the TCP/IP model and analyze packet data. **Open-source software**: Wireshark.
4. Create a presentation on common malware and viruses, including preventive measures and real-world examples.
5. Research and create a report on different data center topologies and architectures (e.g., star, mesh, tree).
6. Conduct a case study of a specific data center or take a virtual tour of a data center, highlighting key components and their functions.

Text Books:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface," Morgan Kaufmann, 2017.
2. Behrouz A. Forouzan, "Data Communications and Networking," McGraw-Hill, 2017.
3. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach," Pearson, 2020.
4. William Stallings, "Cryptography and Network Security: Principles and Practice," Pearson, 2017.
5. Thomas Erl, "Cloud Computing: Concepts, Technology & Architecture," Prentice Hall, 2013.

Reference Books:

1. Andrew S. Tanenbaum, "Modern Operating Systems," Pearson, 2015.
2. M. Morris Mano, "Computer System Architecture," Pearson, 2013.
3. Douglas E. Comer, "Internetworking with TCP/IP," Pearson, 2018.
4. Jerome H. Saltzer and M. Frans Kaashoek, "Principles of Computer System Design: An Introduction," Morgan Kaufmann, 2009.

E-Resources:

1. https://nptel.ac.in/courses/106103068
2. https://nptel.ac.in/courses/106105081
3. https://nptel.ac.in/courses/106104449

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Fundamentals of Python Programming							**Code:** ADES204		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	02	-	03	40	60	25	-	25	150

Prerequisites:

Fundamental Programming Concepts, Basic Knowledge of Command Line, Logical Thinking, Basic Computer Literacy, Understanding of Basic Mathematics.

Course Objectives: After completion of this course, students will able to -

1. To provide a comprehensive introduction to Python.
2. To equip learners with a thorough understanding of Python operators and flow control structures, enabling them to write logical and efficient programs that can perform complex calculations and manage execution flow.
3. To develop proficiency in string manipulation and operations.
4. To explore Python's list and tuple data structures, focusing on exploring different methods.
5. To introduce students to Python's set and dictionary data structures, emphasizing their creation, manipulation.
6. To explain different types of Python functions and their definitions.

Course Outcomes:

CO1	Inculcate various skills in problem solving.
CO2	Demonstrate proficiency in using Python operators and flow control structures, effectively applying them to solve complex problems and manage program execution flow.
CO3	Exhibit the programming skills for the problem-solving using string manipulations.
CO4	Develop the ability to create and manipulate List and Tuple.
CO5	Gain proficiency in working with sets and dictionaries.
CO6	Utilize function to handle various input scenarios effectively.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction:** Introduction, History of python, Features of Python, Limitations of Python, Python Versions, Identifiers, Reserved Words, DATA TYPES, Base Conversions, TYPE CASTING, Fundamental Data Types vs Immutability, Escape Characters, Constants, Installing Python and setting up the development environment (IDEs, text editors), Writing and executing simple Python programs. Applications of python.	5
2.	**Operators and Flow Control Structures:** Operators: Arithmetic Operators, Relational Operators OR Comparison Operators, Equality Operators, Logical Operators, Bitwise Operators, Shift Operators, Assignment operators, Ternary Operator OR Conditional Operator, Special operators, Operator Precedence.	4

	Flow Control Structures: Conditional statements, Iterative Statements, Transfer Statements, del Statement, Difference between del and None, importance of flow control in python.	
3.	**Strings:** Introduction of string, Access Characters of a String, Behavior of Slice Operator , Slice Operator Case Study ,Mathematical Operators for String , len() in-built Function ,Checking Membership, Comparison of Strings, Removing Spaces from the String ,Finding Substrings, Counting substring in the given String, Replacing a String with another String, Splitting of Strings ,Joining of Strings, Changing Case of a String, Checking Starting and Ending Part of the String, Check Type of Characters Present in a String, Formatting the Strings, Important Programs regarding String Concept.	4
4.	**List and Tuple:** List: Creation of List Objects, Accessing Elements of List, List vs Mutability, Traversing the Elements of List, Important Functions of List, Using Mathematical Operators for List Objects, Comparing List Objects, Membership Operators, clear () Function, Nested Lists, List Comprehensions. Tuple: Tuple Creation, Accessing Elements of Tuple, Tuple vs Immutability, Mathematical Operators for Tuple, Important Functions of Tuple, Tuple Packing and Unpacking, Tuple Comprehension, Differences between List and Tuple.	5
5.	**Set and Dictionary:** Set: Creation of Set Objects, Important Functions of Set, Mathematical Operations on the Set, Membership Operators: (in, not in), Set Comprehension Dictionary: How to Create Dictionary, Access Data from the Dictionary, Update Dictionaries, Delete Elements from Dictionary, Important Functions of Dictionary, Dictionary Comprehension. Difference between set and dictionaries	5
6.	**Function and Module:** Functions: Types of Python Functions, defining a Python Function, Calling a Python Function, Syntax, Python Function Arguments, Lambda or anonymous function, Scope of function. Module: Introduction to modules, Introduction to packages in Python, Introduction to standard, library modules	5
	TOTAL	**28**

List of Experiments:

Perform any 12 experiments:

1. Install Python and an IDE/text editor. Write a simple Python program to print "Hello, World!" on the console.
2. Create variables of different data types (integers, floats, strings, Booleans) and perform arithmetic operations on them.
3. Write a Python program that takes user input, performs a calculation, and prints the result.
4. Write a program to determine if a given number is positive, negative, or zero using if-elif-else statements.
5. Write a program to find the largest number among three numbers using nested if-else statements.
6. Define a function that calculates the factorial of a number and call it from the main program.
7. Write a function that takes a list of numbers as input and returns the sum of all elements.

8. Implement a lambda function to square a given number.
9. Create a module that contains functions to perform basic arithmetic operations and import it into another Python script.
10. Use the math module to calculate the area of a circle given its radius.
11. Write a program to sort a list of integers in ascending order.
12. Write a Python program to concatenate two tuples and display the result.
13. Write a program to find the intersection of two sets.
14. Write a program to reverse a given string.
15. Write a program to count the occurrences of a specific character in a string.
16. Write a program that formats a given string to display it with a specified width.
17. "Implement a mini-Project on the basis of python knowledge
    Ex:
    1. Calculator Application
    2. Number Guessing Game
    3. Palindrome Checker
    4. Word Counter"
18. Write a python Program to Print Different Pattern.
19. Write a python Program for finding even numbers from given list using List Comprehensions.

Text Books:

1. Al Sweigart, "Automate the Boring Stuff with Python: Practical Programming for Everyday Tasks," 2nd Edition, No Starch Press.
2. Eric Matthes, "Python Crash Course," 2nd Edition, No Starch Press.
3. David Griffiths, "Head First Programming," O'Reilly.
4. Luciano Ramalho, "Fluent Python," 2nd Edition, O'Reilly Media, Inc.
5. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist," 2nd Edition, O'Reilly Media.

Reference Books:

1. David Beazley and Brian K. Jones, "Python Cookbook," O'Reilly Media, 2013.
2. Mark Pilgrim, "Dive Into Python," Apress, 2009.
3. Mark Lutz, "Learning Python," 5th Edition, O'Reilly Media, 2013.
4. Luciano Ramalho, "Fluent Python," 2nd Edition, O'Reilly Media, 2022.

E-Resources:

1. https://learning.edx.org
2. https://Python.org
3. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Basic of Artificial Intelligence and it's Applications							**Code:** ADPC201		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

Prerequisites:

Knowledge of Statistics, Basic Computer Science Knowledge

Course Objectives:

1. To understand the fundamental concepts and principles of Artificial Intelligence (AI).
2. To gain insight into the field of Data Science and its methodologies.
3. To understand the basic concepts of Machine Learning (ML).
4. To teach students the essential concepts of data modeling.
5. To learn techniques to visually represent data for effective analysis and interpretation.
6. To understand the basics of natural language processing (NLP) and its applications.

Course Outcomes: On completion of the course, learner will be able to -

CO1	Ability to explain the basic principles of AI and its applications.
CO2	Understand basic data analysis techniques and the role of Data Science in various industries.
CO3	Understand Machine learning concept to solve real-world problems.
CO4	Summarize data analysis and visualization in the field of exploratory data science
CO5	Ability to create meaningful visualizations using various tools and libraries.
CO6	Ability to implement NLP techniques for text analysis and understanding

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Artificial Intelligence**: Introduction to Artificial Intelligence, Definition of AI, Foundations of Artificial Intelligence, History and Evolution of Artificial Intelligence, Risks and Benefits of AI, Types of AI, Scope and Applications of AI. **Case studies:** 1. AI in Healthcare - Predictive Diagnostics. 2. Autonomous vehicles, like those developed by Tesla, use AI to process sensor data, navigate roads, and make real-time decisions to drive safely.	7
2.	**Introduction to Data Science**: Introduction of Data Science, need of Data Science Life cycle of data science, types of data, Sources of Data Collection, Applications of Data Science. **Case studies**: 1. Amazon leverages Data Science in its recommendation engine, driving a significant portion of its sales through personalized product suggestions. 2. Netflix uses Data Science for personalized content recommendations, improving user experience by analyzing viewing history and preferences.	7

3.	**Machine Learning Fundamentals:** Definition and significance of Machine Learning (ML), Types of Machine learning: Supervised Learning, Unsupervised Learning, Reinforcement Learning, Differences between AI, ML, and Data Science, Overview of Machine Learning workflow **Case studies**: 1. Spam Detection in Email Services: Automatically categorizes emails and filters out spam. 2. Financial Fraud Detection: identifies fraudulent transactions by analyzing patterns and anomalies in financial data.	7
4.	**Introduction to Data Modeling:** Statistics, Parameter Estimation, and Fitting a Distribution: Descriptive statistics, graphical statistics, maximum likelihood estimation Data Modeling Concepts **Case studies:** 1. Urban Traffic Flow Management 2. E-commerce Product Recommendation System	7
5.	**Data Visualization:** Introduction to Data Visualization, Types of data visualization, Data Visualization Techniques- Histograms, Boxplots, Scatter Plots, Line plot, Bar plot and Heat maps, Tools used in Data Visualization, **Case studies:** 1. COVID-19 Pandemic Tracking and Analysis. 2. Financial Market Analysis for Investment Decision-Making.	7
6.	**Natural Language Processing (NLP):** Introduction of NLP, History of NLP, Knowledge in language processing, Ambiguity in Natural language, stages in NLP, Text Preprocessing Techniques, levels of NLP, Applications of NLP. **Case Studies:** 1. Voice Assistants: Virtual assistants like Google Assistant and Amazon Alexa interact with users through voice commands. 2. Chabot's: Automated customer service bots handle inquiries on websites and apps	7
	TOTAL	**42**

Text Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Third edition, Pearson, 2003.
2. David Dietrich, Barry Hiller, "Data Science and Big Data Analytics", EMC education services, Wiley publication, 2012.
3. Steven Bird, Ewan Klein, and Edward Loper, "Natural Language Processing with Python," O'Reilly Media, 2009.

Reference Books:

1. Kieran Healy, "Data Visualization: A Practical Introduction," Princeton University Press, 2018.
2. Andrew Bruce and Peter Bruce, "Practical Statistics for Data Scientists," O'Reilly Media, 2020.
3. Joel Grus, "Data Science from Scratch," O'Reilly Media, 2019.
4. Foster Provost and Tom Fawcett, "Data Science for Business," O'Reilly Media, 2013.

5. Philip C. Jackson, "Introduction to Artificial Intelligence," Pearson, 1999.
6. Daniel Jurafsky and James H. Martin, "Speech and Language Processing," 3rd Edition, Pearson, 2021.

E-Resources: NPTEL Course

1. https://nptel.ac.in/courses/106102220
2. https://onlinecourses.nptel.ac.in/noc24_ge47/preview
3. https://onlinecourses.nptel.ac.in/noc23_cs104/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)						**Semester:** II			
Course: Generative AI Tools and Prompt Engineering						**Code:** ADVS202			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**IE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	4	-	2	-	-	25	-	-	25

Prerequisites:

Course Objectives:

1. To provide students with a comprehensive understanding of Generative AI language models.
2. To introduce the principles of prompt engineering, including the creation and optimization of effective prompts tailored to specific tasks and applications.
3. To equip students with the skills to use AI prompts in everyday tasks, such as idea generation, customer support, and content creation.
4. To explore various prompt frameworks and specialized techniques, enabling students to apply advanced methods in different scenarios.

Course Outcomes:

CO1	Understand the fundamentals of generative AI and prompt engineering.
CO2	Develop and refine prompts for a variety of AI applications, such as text generation and image creation.
CO3	Employ prompt engineering frameworks for tasks like customer support and copy generation.
CO4	Apply various prompt frameworks to solve complex problem
CO5	Design and implement AI-generated content using tools such as ChatGPT, Midjourney, and AI voice tools.
CO6	Address ethical and bias-related issues in prompt design

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction To Generative AI** : Introduction, Difference between Google and ChatGPT, benefits of chatGPT, future of chatGPT, ChatGPT version , Importance of Prompt Engineering, Basic Concepts and Terminology of prompt engineering	10
2.	**Prompt Overview:** Introduction of Prompt Engineering, Prompt Categories, Informational Prompt, Task specific prompt, Context supplying prompt, Comparative prompt, Role specific prompt, Good Prompt, Main Prompting Steps, prompt Priming: Introduction to prompt primping, Simple Prompt Starters.	10
3	**Principals of prompt Engineering:** Clarity and Structure, Specificity, Context and Examples, Iterative Feedback, Action Verbs and Instructions. Brainstorm New Ideas, Copy Generation, Client and Customer Support/Email, Generate Analogies, Bulk Copy Creation, Effective Prompt Revisions	9

4	**Focused Prompt Frameworks:** Shot Prompting, Chain of Thought Prompting, Tabular Format Prompting, Ask Before Answer Prompting, Fill-In-The-Blank Prompting, Perspective Prompting, Constructive Critic Prompting, Comparative Prompting, Reverse Prompting	9
5	**General Prompt Frameworks**: Types of Prompt Frameworks, Examples of Popular Prompt Frameworks (e.g., TARS, CLEAR),RGC Prompting, Comparative Analysis of Frameworks	9
6	**Advanced Topics in Prompt Engineering:** Addressing Ethical and Bias Issues in Prompts, Cross-disciplinary Applications of Prompts, Future Trends in Prompt Engineering: Use case- Designing a Prompt Framework for a Specific Use Case	9
	Total	**56**

List of Assignment:

1. Create content, synthesize information, Text summarization, word / pdf documents analysis, Text classification, using **any one** of the Generative AI tool like ChatGPT, Gemini, Claude, Copilot.
2. Coding: Combine the power of ChatGPT with programming fundamentals, algorithms, debugging, and documentation
3. Create PPT on given topic by using **any one** of the Generative AI tool like Gamma , Canva
4. AI Writing Tools: Automate writing tasks, generate effective copy, and integrate with Google Sheets/Excel using **any one** of the Generative AI tool like Claude-2 ,Grammerly, Buffer's AI assistant, Jasper
5. AI Image Tool: Create amazing images from prompts, fill in or remove elements of images using in painting and outpointing techniques using **any one** of the Generative AI tool Microsoft Designer Tool,DALL-E3
6. Midjourney: Use prompts, parameters, and modifiers to create amazing images that showcase your personal style and creativity
7. AI Photo Tools: Add motion to images, dynamically enhance image aesthetics, and create custom images in bulk using **any one** of the Generative AI tool like d-id.com, playground AI, leiapix ai, Watermarkremover.io
8. AI Voice Tools: Easily create AI-generated speech for any use case and even clone your own voice entirely using **any one** of the Generative AI Tool like ElevenLabs, tryreplay,play.ht-text to voice
9. AI Video Tools: Create an AI avatar that transforms scripts into presentations and quickly generate social media content using **any one** of the Generative AI tool like Runway ,Synthesia, vidyo ai, heygen ai, Murf.AI
10. AI Music Tools: Create unique compositions for any types of video and save time with a streamlined creative process using **any one** of the Generative AI tool like sounddraw.io, MusicLM ,WaveTool, AIVA

Note-Total duration of course includes all assignments

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Text Books:

1. James Phoenix ,Mike Taylor, "Prompt Engineering for Generative AI", Publisher(s): O'Reilly Media, Inc, May 2024
2. Nathan Hunter," "The Art of Prompt Engineering with ChatGPT: A Hands-on Guide ,Jan 2023

Reference Books:

1. Navveen Balani, "Prompt Engineering: Unlocking Generative AI: Ethical Creative AI for All"
2. Jack Wylder, "An Illustrated Guide to AI Prompt Mastery: for MidJourney, DALL-E, NightCafe, Deep Dream Generator
3. Samuel Inbaraja S, "A Practical and Short Textbook of Prompt Engineering"

E-Resources:

1. https://www.udemy.com/share/108c2m3@Vo0l6ssb2rwlHQzbaBcfHTPH6TQU1GNnNDFWPVRYoq9BEpkDSgfu1mLY4OCyI2XeLw==/
2. https://openai.com/index/dall-e-3/
3. https://chatgpt.com/
4. https://audiodenoise.com/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)						**Semester:** II			
Course: Professional Development - II						**Code:** ADCC203			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	04	-	02	-	-	25	-	-	25

Course Objectives:

1. To introduce students on professional development skills and its importance in building personal and professional life.
2. To bring in self-awareness and realization of Values, Self-discipline and self-grooming for betterment of life and contribution to our Society.

Course Outcomes: After completion of this course, students will be able to -

CO1	Understand the interpersonal skills importance and finding skill gaps for development.
CO2	Know how to be effective in managing our time with application of simple tools & techniques.
CO3	Know the effective components of teamwork and how to be effective in our role for team performance and goals.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Interpersonal Skills:** Understanding on IP skills; Essentials of IP; How to develop IP skills.	24
2.	**Time management:** What is time management? Time study and mapping; Knowing the time management tools & techniques; How to apply tools & techniques for effective time management; Self-evaluation.	16
3.	**Teamwork:** Team and Individual thinking; Characteristics of Teamwork; Importance at work profession; Benefits	16
	TOTAL	**56**

Text Books:

1. Dr. P. K. Sinha, "Interpersonal Skills for Managers", Sage Publications.

Reference Books:

1. John C. Maxwell and Les Parrott, "25 Ways to Win with People", Thomas Nelson, 2013.
2. Robert Bolton, "People Skills: How to Assert Yourself, Listen to Others, and Resolve Conflicts", Touchstone, 1986.
3. Chris Bailey, "The Productivity Project: Accomplishing More by Managing Your Time, Attention, and Energy", Crown Business, 2016.
4. Jon Gordon, "The Power of a Positive Team: Proven Principles and Practices that Make Great Teams Great", Wiley, 2017.

E-Resources:

1. Coursera - "Improving Your Interpersonal Skills", https://www.coursera.org/learn/interpersonal-skills
2. Coursera - "Leading Teams", https://www.coursera.org/learn/leading-teams

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Liberal Learning – II (Guitar)							**Code:** ADCC204A		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Guitar musical instrument.

Course Objectives:

1. To enhance guitar skills through intermediate fingerpicking, lead techniques, and genre exploration, culminating in a polished final performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Execute intermediate fingerpicking techniques with precision and rhythm.
CO2	Apply advanced lead guitar techniques and pentatonic scales effectively.
CO3	Perform confidently across various genres including blues, rock, folk, and classical.
CO4	Deliver a polished final performance through focused practice and preparation.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Rhythm and Timing.	2
2.	Time Signatures.	2
3.	Understanding Basic Rhythms.	2
4.	Circle of Fifths.	2
5.	Introduction to Minor Scales.	2
6.	Advanced Chord Shapes.	2
7.	Introduction to Lead Techniques.	2
8.	Introduction to Pentatonic Scale.	2
9.	Practice and Review.	2
10.	Exploring Different Genres.	2
11.	Final Project Planning.	2
12.	Intensive Practice.	2
13.	Pre-Performance Preparation.	2
14.	Final Performance.	2
	TOTAL	**28**

Text Books:

1. David Hodge, "Guitar Theory", DK Publishing.

Reference Books:

1. Russ Shipton, "The Complete Guitar Player", Published by Wise.
2. Vincent Ong, Alfred Khp," Classical Guitar Advanced Studies Repertoires", Dynamic Publication.

E-Resources:

1. https://www.youtube.com/watch?v=BBz-Jyr23M4

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Liberal Learning – II (Singing)							**Code:** ADCC204B		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music in singing.

Course Objectives:

1. To develop advanced singing techniques and ear training through Indian classical music, focusing on repertoire selection, effective rehearsal, and performance presentation.

Course Outcomes: After completion of this course, students will be able to -

CO1	Master legato, staccato, and advanced vocal methods in Indian classical music.
CO2	Improve musical ear through rigorous training and diverse classical repertoire.
CO3	Apply effective rehearsal strategies to prepare and present a polished performance.
CO4	Deliver a well-executed performance of selected Indian classical pieces with artistic expression

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Vibrato and Ornamentation.	2
2.	Range Extension.	2
3.	Legato and Staccato.	2
4.	Advanced Ear Training.	2
5.	Basics of Indian Semi Classical Music.	2
6.	Improvisation Techniques.	2
7.	Selecting Repertoire for Performance.	2
8.	Rehearsal Techniques.	2
9.	Dress Rehearsal.	2
10.	Final Performance.	2
11.	Performance Review.	2
12.	Exploring New Repertoire.	2
13.	Advanced Techniques and Styles.	2
14.	Course Recap and Future Directions.	2
	TOTAL	**28**

Text Books:

1. Dr. Theodore Dimon, "Anatomy of the Voice, This Is a Voice".

Reference Books:

1. Richard Miller, "The Structure of Singing", Schirmer Books, London.
2. Jennifer Hamady, "The Art of Singing", Published by Hal Leonard.

E-Resources:

1. https://www.youtube.com/watch?v=4hNq9qykOyE
2. https://www.youtube.com/watch?v=b14gkmECz-Y

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Liberal Learning – II (Cinematography)							**Code:** ADCC204C		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.

Course Objectives:

1. To master videography by learning camera techniques, shooting methods, and editing, culminating in a final project showcasing advanced skills in video production.

Course Outcomes: After completion of this course, students will be able to -

CO1	Operate camera components and techniques for steady, sharp video shooting.
CO2	Apply rule of thirds, framing, and stabilization methods effectively.
CO3	Use advanced editing tools and sound design for polished video projects.
CO4	Deliver a comprehensive final video project demonstrating learned skills.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to Videography	2
2.	Understanding camera components (lens, sensor, viewfinder)	2
3.	Techniques for steady shooting (tripods, handheld, gimbals)	2
4.	Understanding the rule of thirds, leading lines, and framing in video	2
5.	In-depth explanation of the exposure triangle: aperture, shutter speed, and ISO	2
6.	Importance of audio in videography	2
7.	Techniques for achieving sharp focus	2
8.	Motion and Stabilization	2
9.	Storyboarding and Planning	2
10.	Filming Techniques	2
11.	Introduction to Video Editing	2
12.	Introduction to advanced editing tools (color correction, audio editing, effects)	2
13.	Sound Design and Mixing	2
14.	Final Project Presentation and Review	2
	TOTAL	**28**

Text Books:

1. Tania Hoser, "Introduction to Cinematography", Taylor & Francis.

Reference Books:

1. Anat Pick, "Screening Nature", Berghahn Books.
2. Blain Brown, "Cinematography: Theory and Practice", Taylor & Francis.

E-Resources:

1. https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRbxKOm
2. https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Liberal Learning – II (Dance)							**Code:** ADCC204D		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.

Course Objectives:

1. To develop advanced dance techniques, expressive skills, and performance readiness in Indian classical dance, culminating in a final performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Develop advanced techniques in footwork, postures, and hand gestures, with a focus on fluidity and expression.
CO2	Embody various characters and emotions through in-depth exploration of Abhinaya (expressional dance).
CO3	Execute learned dance pieces with precision, synchronization, and advanced rhythmic variations.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to Character Portrayal.	2
2.	Rehearsal and Feedback.	2
3.	Advanced Footwork and Postures.	2
4.	Advanced Hand Gestures and Movements.	2
5.	Rhythmic Variations and Combinations.	2
6.	Rehearsal of Dance Piece.	2
7.	Performance Techniques.	2
8.	Integrating Steps and Expressions.	2
9.	Full Dress Rehearsal.	2
10.	Improvisation and Creative Movement.	2
11.	Corrections and Adjustments.	2
12.	Mini Performance.	2
13.	Introduction to Abhinaya in Depth.	2
14.	Preparing a New Short Dance Item.	2
	TOTAL	**28**

Text Books:

1. Kapila Vatsyayan, "Indian Classical Dance", Publications Division Ministry of Information & Broadcasting.

Reference Books:

1. Shubhada Varadkar, "The Glimpse of Indian Classical Dance", Krimiga Books, Krimiga Content Development Pvt. Ltd.

E-Resources:

1. https://youtu.be/VP2jLLk8_jA?si=zg6_muy1w7jE5mbi
2. https://youtu.be/xZEP4XupwJA?si=YBt3RmcHxCRc2JSr

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)								**Semester:** II	
Course: Liberal Learning – II (Synthesizer/Keyboard)								**Code:** ADCC204E	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Keyboard musical instrument.

Course Objectives:

1. To develop advanced musical skills through complex progressions, improvisation, and composition, culminating in a polished performance and mastery of selected repertoire.

Course Outcomes: After completion of this course, students will be able to -

CO1	Apply complex chord progressions and advanced scales effectively in performance.
CO2	Demonstrate proficiency in improvisation and advanced chord voicings.
CO3	Perform selected repertoire with refined technique and stage presence.
CO4	Successfully showcase learned skills through a polished recital or performance.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	Introduction to more complex progressions (e.g., ii-V-I)	2
2.	Basics of improvisation	2
3.	Learning advanced scales (e.g., blues scale, pentatonic scale)	2
4.	Learning advanced chord voicings and inversions	2
5.	Advanced Arpeggios and Runs	2
6.	Basics of composing music	2
7.	Initial practice on selected repertoire	2
8.	Focused practice on repertoire pieces	2
9.	Understanding stage presence and performance techniques	2
10.	Final adjustments and practice on repertoire	2
11.	Attending or reviewing a masterclass	2
12.	Receiving personalized feedback on playing	2
13.	Dress rehearsal for recital or performance	2
14.	Showcasing learned skills and pieces	2
	TOTAL	**28 hrs.**

Text Books:

1. Chuan C. Chang, Fundamentals of Piano Practice, Createspace Independent Publishing Platform

Reference Books:

1. Michael Rodman, "Keyboard for the Absolute Beginners", Alfred Publishing.
2. Davis Dorrough, "Piano Scales".

E-Resources:

1. https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH
2. https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Liberal Learning – II (Basketball)							**Code:** ADCC204F		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To master advanced basketball skills, strategies, and mental conditioning to excel in team play, complex scenarios, and tournament preparation.

Course Outcomes: After completion of this course, students will be able to -

CO1	Demonstrate mastery of advanced dribbling, passing, shooting, and defensive techniques.
CO2	Apply complex defensive systems, advanced team play, and game strategies in mixed scenarios.
CO3	Develop the mental toughness, conditioning, and strategic insights needed for successful tournament performance

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Advanced Dribbling Techniques	2
2.	Advanced Passing Techniques	2
3.	Advanced Shooting Techniques	2
4.	Advanced Defense Techniques	2
5.	Position Specific Training	2
6.	Conditioning & Strength Training	2
7.	Mental Toughness & Focus	2
8.	Advance Team Play	2
9.	Complex Defensive System	2
10.	Mixed Scenarios & Situational Drills	2
11.	Tournament Preparation	2
12.	Advance Game Play & Strategy	2
13.	Mastery & Final Assessment	2
14.	Final Scrimmage	2
	TOTAL	**28**

Text Books:

1. K.K. Sharma, "Basketball: Skills and Drills", Sports Publications

Reference Books:

1. Dr. P.K. Kher, "Basketball Coaching: A Complete Guide", Khel Prakashan
2. S. Reddy, “The Ultimate Guide to Basketball Training”, Blue Rose Publisher

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Liberal Learning – II (Cricket)							**Code:** ADCC204G		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop advanced cricket skills and strategies in batting, bowling, and fielding, with a focus on mental conditioning, tactical execution, and competitive performance through intensive practice and match simulations.

Course Outcomes: After completion of this course, students will be able to -

CO1	Demonstrate advanced techniques in batting, bowling, and fielding, including targeted drills and intensive practice.
CO2	Apply batting and bowling strategies, and execute tactical plans during match simulations and competitive play.
CO3	Develop strong mental conditioning and teamwork skills, preparing for high-performance in competitive matches and final assessments.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Batting Strategies.	2
2.	Bowling Strategies.	2
3.	Fielding Strategies.	2
4.	Match Simulations and Tactical Execution.	2
5.	Targeted Skill Improvement.	2
6.	Mental Conditioning.	2
7.	Intensive Match Simulations.	2
8.	Advanced Batting Drills.	2
9.	Advanced Bowling Drills.	2
10.	Fielding and Wicket keeping in Game Conditions.	2
11.	Game Analysis and Strategy Sessions.	2
12.	Final Skill Polishing.	2
13.	Teamwork and Communication.	2
14.	Competitive Matches and Final Assessments.	2
	TOTAL	**28**

Text Books:

1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan
2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press

Reference Books:

1. Sachin Tendulkar, "Playing It My Way", Hachette India
2. Rahul Dravid, "Cricket: The Game of Life", Penguin India

E-Resources:

1. Sports and Performance Nutrition, IIT Madras, https://onlinecourses.nptel.ac.in/noc24_hs82/preview

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Liberal Learning – II (Rifle and Pistol Shooting)							**Code:** ADCC204H		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To achieve advanced proficiency in rifle shooting through specialized training, technical refinement, and mental preparation for competitive performance.

Course Outcomes: After completion of this course, students will be able to -

CO1	Master advanced rifle shooting techniques and positions to achieve higher scores.
CO2	Develop strong mental preparation and focus techniques for peak performance and overcoming technical hurdles.
CO3	Gain specialized training and match practice, preparing them for ISSF events and advanced shooting challenges.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Understand and learning about advance rifle position	2
2.	Advance technical knowledge	2
3.	Advance Technique Refinement	2
4.	Learning about advance shooting and technics for achieving score	2
5.	Specialized Training	2
6.	Mental Preparation and Focus	2
7.	Peak Performance and analyses	2
8.	Advanced Skills Development	2
9.	Tactical Applications and working about single shoot	2
10.	Advanced Challenges and Readiness	2
11.	Review and Consolidation	2
12.	Focus on technical and mental hurdles	2
13.	Person to person attention	2
14.	Match practice and preparation as per ISSF event	2
	TOTAL	**28**

Reference Books:

1. David Watson, "ABCs of Rifle Shooting", Gun Digest (Imprint of KP Books), 2014

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)						**Semester:** II			
Course: Liberal Learning – II (Volleyball)						**Code:** ADCC204I			
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To achieve advanced proficiency in volleyball by mastering complex techniques, strategic systems, and mental conditioning, while preparing for competitive play and tournament scenarios.

Course Outcomes: After completion of this course, students will be able to -

CO1	Demonstrate expertise in advanced serving, spiking, setting, and blocking techniques tailored to specific positions.
CO2	Implement complex offensive and defensive systems and adapt to mixed scenarios through situational drills and gameplay.
CO3	Develop mental toughness, conditioning, and strategic insights necessary for successful tournament preparation and performance.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Advanced Serving Techniques	2
2.	Advanced Spiking Techniques	2
3.	Advanced Setting Techniques	2
4.	Advanced Blocking Techniques	2
5.	Position – Specific Training	2
6.	Conditioning & Strength Training	2
7.	Mental Toughness & Focus	2
8.	Game Analysis & Feedback	2
9.	Complex Offensive System	2
10.	Complex Defensive System	2
11.	Mixed Scenarios & Situational Drills	2
12.	Advanced Gameplay & Strategies	2
13.	Review & Reinforcement	2
14.	Tournament Preparation	2
	TOTAL	**28**

Text Books:

1. Jitendra Kumar, "The Complete Guide to Volleyball", Blue Rose Publisher

Reference Books:

1. N. Ramachandran, "Volleyball: Steps to Success", Sports Publication

E-Resources:

1. https://coachtube.com/course/volleyball/volleyball-for-beginners/7004

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Liberal Learning – II (Football)							**Code:** ADCC204J		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To enhance players' technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.

Course Outcomes: After completion of this course, students will be able to -

CO1	To explain key concepts of transition play, positional drills, and the importance of endurance and stamina in football.
CO2	Apply advanced tactics during simulation matches, analyze high-pressure situations.
CO3	Students will design a game week routine that covers match preparation, mental and physical readiness, and post-match analysis, evaluating its impact on team performance and skills.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Transition Play.	2
2.	Positional Drills.	2
3.	Endurance and Stamina.	2
4.	Video Analysis and Feedback.	2
5.	Advanced Tactics and Strategy.	2
6.	High-Pressure Situations.	2
7.	Leadership and Team Roles.	2
8.	Refining Skills and Tactics.	2
9.	Match Preparation.	2
10.	Mental and Physical Preparation.	2
11.	Game Week Routine.	2
12.	Post Goalkeeper Training.	2
13.	Post-Match Analysis and Recovery.	2
14.	Simulation Matches.	2
	TOTAL	**28**

Text Books:

1. Srinivasan J. B, "Football Coaching: A Comprehensive Guide", Sports Publishing.

Reference Books:

1. Rob Ellis, "The Complete Guide to Coaching Soccer", Meyer & Meyer Sport.

E-Resources:

1. Udemy – Soccer Courses - https://www.udemy.com/topic/soccer/

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)								**Semester:** I	
Course: IT Proficiency								**Code:** ADAE201	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	04	-	02	-	-	25	-	-	25

Prerequisites:

Basic Computer Skills

Course Objectives:

1. To develop proficiency in essential office software and tools, including MS Word, MS Excel, MS PowerPoint, and LaTeX, to create, analyze, and present professional documents and data effectively, while understanding ethical internet use and leveraging AI tools.

Course Outcomes: After completion of this course, students will be able to -

CO1	Create and format professional documents using MS Word.
CO2	Organize and analyze data using Excel's features.
CO3	Analyze and visualize complex data with pivot tables and charts.
CO4	Analyze advanced Excel functions, pivot tables, macros, and data protection techniques.
CO5	Create Professional Documents Using LaTeX.
CO6	Apply ethical practices in using internet resources and AI tools.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Basics of Computer and MS Word:** Awareness of computer Basics **MS-Word:** Text Basics, Text Formatting and saving file, Working with objects, Header &footers, Working with bullets and numbered lists, Tables, Styles and Content, Merging documents, Sharing and maintaining document, Proofing the document, Printing.	08
2.	**MS-Excel:** Introduction to Excel, Formatting excel work book, Perform calculations with functions, Sort and Filter data with Excel, Create effective 2D and 3D charts to Present data visually.	10
3.	**Advance MS-Excel**: Analyze data using pivot tables and pivot charts, Protecting and sharing the work book, Use Macros to automate tasks, Proofing and Printing, More useful functions in excel, Goal seek and scenario features, V-lookup and H-lookup functions, Advanced sort and filter in excel.	10
4.	**MS-PowerPoint**: Setting up PowerPoint environment, Creating slides and applying themes, Working with bullets and numbering, Working with objects, Hyperlinks and action buttons, Working with movies and sounds, Using SmartArt and Tables, Animation and slide transition, Using slide master, Slide show option, Proofing and Printing.	10

5	**Introduction to Latex:** Installation of the software LaTeX , Understanding Latex compilation, Basic Syntax, Writing equations, Matrix, Tables. **Page Layout** – Titles, Abstract Chapters, Sections, References, Equation references, citation. List making environments, Table of contents, Generating new commands, Figure handling, Numbering, List of figures, List of tables, Generating index. **Packages** - Geometry, Hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tilez listing. Classes: article, book, report, beamer, slides. IEEtran. **Applications -** Writing Resume, Writing articles/ research papers, project report.	10
6	**Internet Ethics & AI tools:** Working with Internet and-mail, Using the Internet, Internet Ethics and Safety, Social Media, **AI Tools**: Jasper, GitHub Copilot, Synthesia, Writesonic.	08
	TOTAL	**56**

List of Experiments:

1. Create a collaborative document project where multiple users contribute to a document using MS Word's track changes and commenting features.
2. To analyze and visualize data effectively using Excel's functions and charts, aiming to create insightful and dynamic data visualizations.
3. Develop a financial modeling project using Excel, incorporating advanced functions like goal seek, scenario analysis, and pivot tables. Build automation using macros for repetitive tasks.
4. Create an interactive multimedia presentation on a complex topic of interest. Incorporate animations, transitions, embedded videos, and interactive elements like hyperlinks and action buttons.
5. Design and implement a digital marketing campaign for a fictitious product or service. Create email newsletters, social media posts, and analyze campaign performance metrics.
6. Prepare research article using Latex.

Text Books:

1. Banerjee Snigdha, "MS Word 2000", New Age International.
2. Quentin Docter, Q., et al., "CompTIA IT Fundamentals Study Guide: Exam FC0-U61", Wiley, USA.
3. Lambert, J., Frye, C., et al., "Microsoft Office 2019 Step by Step", Microsoft Press, USA.

Reference Books:

1. Walkenbach John, "Excel 2013 Bible", Wiley Publishing House.
2. Wempen Faithe, "Microsoft PowerPoint 2010 Bible", Wiley Publishing House.
3. Miller, M., "Internet Basics Absolute Beginner's Guide", Que Publishing, USA.
4. Miller, M., "Computer Basics Absolute Beginner's Guide", Que Publishing, USA.

E-Resources:

1. Microsoft Office Support provides tutorials and guides for MS Office applications. https://support.microsoft.com/en-us/training
2. Digital Skilling by NPTEL - https://elearn.nptel.ac.in/shop/nptel/digital-skilling/?v=c86ee0d9d7ed

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Program: B. Tech. (Artificial Intelligence And Data Science)							**Semester:** II		
Course: Internship - I							**Code:** ADIN201		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	-	-	02	-	-	25	-	-	25

Preamble:

Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.

Course Objectives:

1. To exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry.
2. To learn to implement the technical knowledge in real industrial situations.

Course Outcomes: After completion of this course, students will be able to -

CO1	Gain exposure to industry practices and understand how academic concepts are applied in professional settings.
CO2	Develop and demonstrate effective communication and teamwork skills within a work environment.
CO3	Improve your problem-solving and time management skills by working in real-world industry settings.

Internship Requirements

1. **Internship Duration:** It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 3 to 5 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW).
2. **Internship Opportunities:** Students can explore various opportunities for internships at:
    a. Industries
    b. Research labs or organizations
    c. Collegiate clubs
    d. In-house research projects
    e. Online internships
3. **Support and Assistance:** Students can seek assistance for securing internships from:
    a. The Training and Placement cell, along with departmental coordinators
    b. Department or institute faculty members
    c. Personal contacts
    d. Directly connecting with industries or organizations
4. **Request Letter:** Once an industry, research organization, or collegiate club is identified, students must obtain a request letter from the concerned department or placement office. This letter, in the

standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.

5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.