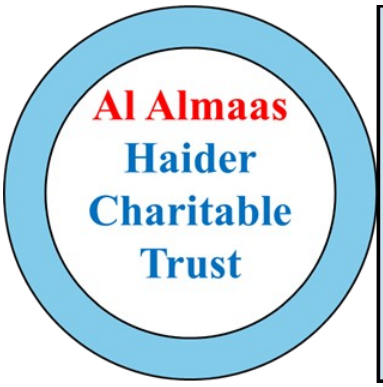

Al Haider College of Technology at Ranchi, Jharkhand

Syllabus of

B.Tech. in Artificial Intelligence & Machine Learning

Semester-II

AAHCT, Ranchi, Jharkhand

Al Haider College of Technology Department of Engineering

Faculty – Bachelor of Technology in Artificial Intelligence & Machine Learning

SEMESTER –II

Sl. No.	Course Code	Course Title	Periods	Total Credits
			L	T
Theory				
1	AMHS201	English	3	0
2	AMBS202	Mathematics-II	4	1
3	AMES203	Chemistry	3	1
4	AMES204	Problem Solving and Programming	3	0
5	AMHS205	Universal Human Values – II	2	1
Practical				
6	AMBL201	Chemistry Lab	0	0
7	AMEL202	Problem Solving and Programming Lab	0	0
8	AMEL203	Workshop	0	0
9	AMAU204	Sports and Yoga	2	0
		Total	**17**	**3**

Subject: ENGLISH

Code: AMHS201

3 Credits | Semester 2

Total Lecture: 45 Total Tutorial: 0

A. Introduction

- Build competence in English grammar and vocabulary for effective communication by developing the Reading, Writing, Listening and Speaking skills of students.

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

- To enhance communication skills through formal and informal modes.
- To apply technical writing and communication skills in their academic and professional life.
- To gain self-confidence with improved command over English.
- To understand the technical aspects of communication for better performance in extracurricular activities, recruitment process and prospective jobs.
- To develop and deliver professional presentations.

C. SYLLABUS

UNIT I: FUNDAMENTALS OF COMMUNICATION SKILLS: Importance of communication through English, Process of communication and factors that influence speaking- Importance of audience and purpose, Principles of communication, comparing general communication and business Communication, Professional Communication, barriers to communication, strategies to overcome communication barriers, formal and informal communication.

UNIT II: WRITING SKILLS: Basics of Grammar, Placing of Subject and Verb, Sentence Struc- tures, Use of Phrases and Clauses in sentences, Importance of proper punctuation, Creating coherence, Techniques for writing precisely, Parts of Speech, Uses of Tenses, Active and Passive, Modes of Writing.

UNIT III: VOCABULARY BUILDING AND WRITING: The Concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes, Synonyms & Antonyms- Words often confused, One-word substitutes, Idioms and Phrasal Verbs, Abbreviations of Scientific and Technical Words.

UNIT IV: SPEAKING SKILLS: Introduction to Phonetic Sounds & Articulation, Word Accent, Rhythm and Intonation, Interpersonal Communication, Oral Presentation, Body Language and Voice Modulation (Para linguistics and Non-Verbal), Negotiation and Persua- sion, Group Discussion, Interview Techniques (Telephonic and Video Conferencing).

UNIT V: TECHNICAL WRITING: Job Application, CV Writing, Business Letters, Memos, Minutes, Notices, Report Writing Structures, E-mail Etiquette, Blog Writing.

D. TEXT BOOKS:

1. Ludlow R. and Panton F., The Essence of Effective Communication, Prentice Hall, 2020.
2. Kul Bhushan Kumar & R. S. Salaria, Effective Communication Skills, Khanna Publishing House, 2018.
3. Dr. Bikram K. Das et al., An Introduction to Profession English and Soft Skills", Cambridge University Press, 2009.

E. REFERENCES:

1. Michael Mccarthy and Felicity O'Dell, "English Vocabulary in Use", McCarthy M, Cambridge University Press, 3rd Edition, 2017.
2. Raman M. Sharma S, "Technical Communication: Principles and Practice, Raman, Oxford University Press, 2nd Edition, 2012.

F. ONLINE/NPTEL COURSES:

1. English Language and Literature: https://nptel.ac.in/courses/109103020
2. Business English Communication: https://nptel.ac.in/courses/109106129
3. Technical English: https://nptel.ac.in/courses/109106066

Subject: MATHEMATICS-II

Code: AMBS202

4 Credits | Semester II

Total Lecture: 60 Total Tutorial: 12

A. Introduction

- The course aims to formulate and solve partial differential equations and apply Laplace and Fourier transforms within the engineering domain.

B. Course Outcomes:

- To formulate and solve various types of partial differential equations.
- To understand the Laplace transform and its properties.
- To apply Laplace transforms to solve ordinary differential equations with constant coefficients and simultaneous ordinary differential equations.
- To understand and apply Fourier transform techniques, including the Fourier integral theorem, properties of Fourier transforms, convolution, and Parseval's identity.
- To apply Fourier series and harmonic analysis, enabling them to analyze and synthesise periodic signals and functions in various engineering and mathematical applications.

C. SYLLABUS

UNIT I: PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equations; Solutions of standard types of first-order partial differential equations; Lagrange's linear equation; Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II: LAPLACE TRANSFORM: Existence conditions; Transforms of elementary functions; Properties; Transform of unit step function and unit impulse function; Transforms of derivatives and integrals; Transforms of Periodic Functions; Initial and final value theorems.

UNIT III: INVERSE LAPLACE TRANSFORM: Inverse Laplace Transforms – Properties, Convolution theorem, Application - Solution of ordinary differential equations with constant coefficients - Solution of simultaneous ordinary differential equations.

UNIT IV: FOURIER TRANSFORM: Fourier Integral theorem (statement only); Fourier trans- form and its inverse; Properties: Fourier sine and cosine transforms; Properties, convolution and Parseval's identity.

UNIT V: FOURIER SERIES: Dirichlet's conditions; Expansion of periodic functions into Fourier series- Change of interval; Half-range Fourier series; Root mean square value - Parseval's theorem on Fourier coefficients; Harmonic analysis.

D. TEXT BOOKS:

1. Grewal B.S, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 43rd Edition, 2015.
2. Veerarajan T, Transforms and Partial Differential Equations, Tata McGraw-Hill, New Delhi, 2012.

E. REFERENCES:

1. Bali N.P and Manish Goyal., A Text Book of Engineering Mathematics", Laxmi Publications(P) Ltd, 2011.
2. Erwin Kreyszig, Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 9th Edition, 2011.
3. Ramana B.V., Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.

F. ONLINE/NPTEL Courses:

1. https://nptel.ac.in/courses/111106139
2. https://nptel.ac.in/courses/111101153
3. https://nptel.ac.in/courses/111107119

Subject: CHEMISTRY

Code: AMES203

3 Credits | Semester II

Total Lecture: 45 Total Tutorial: 9

A. Introduction

- To understand the developments and breakthroughs efficiently with upgraded knowledge of new technologies.

B. Course Outcomes:

- To analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- To rationalise bulk properties and processes using thermodynamic considerations.
- To distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- To rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- To understand the major chemical reactions that are used in the synthesis of molecules.

C. SYLLABUS:

UNIT I: ATOMIC AND MOLECULAR STRUCTURE: Schrodinger equation. Particle in a box solution and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Pi-molecular orbitals of butadiene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure and role of doping of solids.

UNIT II: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS: Principles of spectroscopy and selection rules. Electronic spectroscopy of Fluorescence and its applications in medicine. Applications of Vibrational and rotational spectroscopy of diatomic molecules. Nuclear magnetic resonance imaging and surface characterization techniques.

UNIT III: USE OF FREE ENERGY IN CHEMICAL EQUILIBRIUM: Thermodynamics functions: energy, entropy and free energy. Applications of Cell potentials, Nernst equation, acid-base, oxidation-reduction and solubility equilibrium. Use of free energy considerations in metallurgy through Ellingham diagrams. Intermolecular forces and potential energy: surfaces: Ionic, dipolar and van Der Waals interactions. Equations on state of real gases and critical phenomena.

UNIT IV: PERIODIC PROPERTIES: Effective nuclear charge, variations of s, p, d and f orbital and energies of atoms in the periodic table, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability and molecular geometries.

UNIT V: STEREO CHEMISTRY: Representations of 3-dimensional structures, structural isomers and stereoisomers, symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Organic reactions and synthesis of a drug molecule: Introduction to reactions involving substitution, addition, elimination, oxidation and reduction. Synthesis of a commonly used drug molecule.

D. TEXT BOOKS:

1. Manisha Agrawal, Chemistry-I, Khanna Book Publishing Co., 1st Edition, 2021.
2. P.W. Atkins, Julio de Paula and James Keeler, Physical Chemistry", Oxford University, 11th Edition, 2018.
3. B. H. Mahan, University chemistry, Pearson Education, 4th Edition, 2013.
4. C.N.Banwell, Fundamentals of Molecular Spectroscopy, 3rd Edition, 2008.

E. REFERENCES:

1. K.P.C. Volhardt and N. E. Schore, Organic Chemistry: Structure and Function, 5th Edition, 2022.

F. ONLINE/NPTEL COURSES:

1. Spectroscopic Techniques for Pharmaceutical and Biopharmaceutical Industries: https://nptel.ac.in/courses/104102113
2. Engineering Chemistry I: https://archive.nptel.ac.in/courses/122/106/122106028
3. Quantum Chemistry of Atoms and Molecules: https://nptel.ac.in/courses/104101124

Subject: PROBLEM SOLVING AND PROGRAMMING

Code: AMES204

3 Credits | Semester II

Total Lecture: 45 Total Tutorial: 0

A. Introduction

- To acquaint knowledge of programming in python and learn the concepts, principles, functions and develop an application.

B. Course Outcomes:

- To understand the basic concepts and working principles of Python Programming.
- To develop algorithmic solutions to simple computational problems.
- To understand the structure of solving problems using programming.
- To explore the concepts of compound data using Python lists, tuples, and dictionaries.
- To explore the workings of PDFs and documents using manipulating images.

C. SYLLABUS

UNIT I: INTRODUCTION: History, Features, Working with Python, Installing Python, basic syntax, Data types, variables, Manipulating Numbers, Text Manipulations, Python Build in Functions.

UNIT II: COMPONENTS OF PYTHON PROGRAMMING: Python objects and other languages, operator Basics, Numbers, String, List, Tuples, Dictionaries, Files, Object Storage, Type Conversion, Type Comparison, Statements, Assignments, and Control Statements.

UNIT III: FUNCTIONS AND MODULES: Functions Definition and Execution, Arguments, Return Values, Advanced Function Calling, Modules, importing modules, Tricks for Importing Modules, Packages, Creating a module.

UNIT IV: OBJECT ORIENTED AND EXCEPTION HANDLING: Classes and Objects, creating a class, class methods, class inheritance. Exceptions Handling: Build in Exceptions. Files: File operations, reading a file content, writing a file, change position, controlling file I/O, manipulating file paths.

UNIT V: APPLICATIONS: Working with PDF and Word Documents, Working with CSV Files and JSON Data, Sending Email and Text Messages, Manipulating Images, Using Python for Multimedia.

D. TEXT BOOKS:

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, Shroff O'Reilly Publishers, 2nd edition, 2016.
2. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python, Revised and updated for Python, Network Theory Ltd., 2011.
3. Martin C. Brown, The Complete reference - Python, Tata McGraw Hill edition, 2010.

E. REFERENCES:

1. Eric Matthes, A Hands-On, Project-Based Introduction To Programming Paper- back–3", 2nd edition, Edition, 2019.
2. Budd T A, Exploring Python", Tata McGraw Hill Education, 2011.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.

F. ONLINE/NPTEL COURSES:

1. Programming, Data Structures and Algorithms using Python: https://nptel.ac.in/courses/106106145
2. The Joy of Computing using Python: https://nptel.ac.in/courses/106106182
3. Python for Data Science: https://nptel.ac.in/courses/106106212

Subject: UNIVERSAL HUMAN VALUES – II

Code: AMHS205

2 Credits | Semester II

Total Lecture: 45 Total Tutorial: 9

A. Introduction

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

B. Course Outcomes:

- To have a holistic vision of life
- To enhance socially responsible behavior
- To understand the responsibility of environmental work
- To understand the Competence and Capabilities for Maintaining Health and Hygiene
- To appreciate the aspiration for excellence (merit) and gratitude for all

C. SYLLABUS

UNIT I: INTRODUCTION TO VALUE EDUCATION: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happi- ness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.

UNIT II: HARMONY IN THE HUMAN BEING: Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

UNIT III: HARMONY IN THE FAMILY AND SOCIETY: Harmony in the Family, the Basic Unit of Human Interaction, 'Trust', Foundational Value in Relationship,' Respect', Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

UNIT IV: HARMONY IN THE NATURE/EXISTENCE: Understanding Harmony in Nature, Interconnectedness, Self-Regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence. Describing, defining, Classifying, providing examples or evidence, writing the introduction and a conclusion.

UNIT V: IMPLICATIONS OF THE HOLISTIC UNDERSTANDING: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models- Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

D. TEXT BOOKS:

1. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing Company, New Delhi, 2022.
2. R R Gaur, R Asthana, G P Bagaria, The Textbook - A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi, 2nd Edition, 2019.
3. RR Gaur, R Asthana, G P Bagaria, The Teacher's Manual- Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Edition, 2019.

E. REFERENCES:

1. Annie Leonard, The Story of Stuff, Paperback, 2011.
2. A.N. Tripathi, Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. Mohandas Karamchand Gandhi, The Story of My Experiments with Truth", FP classic, 2009.
4. A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, VanVidya: Ek Parichaya", 1999.

Subject: CHEMISTRY LAB

Code: AMBL201

2 Credits | Semester II

Total Lecture: 0 Total Period: 45

A. Introduction

- To explain various methods of volumetric analysis, i.e. Redox, Iodometric, plexometric, Neutralization, etc. and use of conductivity meter for measurement of conductance of water sample.

B. Course Outcomes:

- To illustrate the principles of physical chemistry relevant to the study of the rate of reactions.
- To estimate rate constants of reactions from the concentration of reactants/products as a function of time.
- To measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
- To explore chemical concepts and changes in matter and acquire scientific skills in the laboratory.
- To synthesize a small drug molecule and analyze a salt sample.

C. SYLLABUS

S. No:	NAME OF EXPERIMENTS
1.	Determination of surface tension and viscosity
2.	Thin layer chromatography
3.	Ion exchange column for removal of hardness of water
4.	Determination of chloride content of water
5.	Determination of cell constant and conductance of solutions.
6.	Potentiometry - determination of redox potentials and emfs.
7.	Synthesis of a polymer/drug.
8.	Determination of the partition coefficient of a substance between two immiscible liquids.
9.	Saponification/acid value of an oil.
10.	Chemical analysis of a salt
11.	Lattice structures and packing of spheres.
12.	Determination of the rate constant of a reaction.
13.	Colligative properties using freezing point depression.
14.	Models of potential energy surfaces.
15.	Chemical oscillations- Iodine clock reaction.
16.	Adsorption of acetic acid by charcoal.

17.	Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg

Subject: PROBLEM SOLVING AND PROGRAMMING LAB

Code: AMEL202

2 Credits | Semester II

Total Lecture: 0 Total Period: 45

A. Introduction

- To develop an application using python libraries and packages

B. Course Outcomes:

- To develop an application for simple real life problems with flow charts.
- To write a program using python statements and expressions.
- To write a program by implementing functions and strings in python.
- To demonstrate an application by dealing with an exceptions
- To explore pygame tool by developing a gaming application.

C. SYLLABUS

S. No:	NAME OF EXPERIMENTS
1.	Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc
2.	Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points
3.	Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern
4.	Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building – operations of list & tuples
5.	Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets &Dictionaries
6.	Implementing programs using Functions. (Factorial, largest number in a list, area of shape
7.	Implementing programs using Strings. (Reverse, palindrome, character count, re-placing characters
8.	Implementing programs using written modules and Python Standard Libraries (pan- das, numpy. Matplotlib, Scipy
9.	Implementing real-time/technical applications using File handling. (Copy from one file to another, word count, longest word
10.	Implementing real-time/technical applications using Exception handling. (Divide by zero error, voter's age validity, student mark range validation
11.	Exploring Pygame tool. Developing a game activity using Pygame like bouncing

	ball, car race etc

Subject: WORKSHOP

Code: AMEL203

3 Credits | Semester 1

Total Lecture: 0 Total Period: 45

A. Introduction

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

B. Course Outcomes:

- To fabricate components with their own hands.
- To relate practical knowledge of the dimensional accuracies and dimensional toler- ances possible with different manufacturing processes.
- To design small devices of their interest by assembling different components.
- To practice Arc Welding and Gas Welding.
- To develop a casted products.

C. SYALLBUS

S. No:	NAME OF Workshope	
1.	Manufacturing Methods- casting, forming, machining, joining, advanced manufac- turing methods	Machine shop
2.	CNC machining, Additive manufacturing	Fitting shop
3.	Fitting operations & power tools	Carpentry
4.	Electrical & Electronics	Electrical & Electronics
5.	Carpentry	Welding shop (Arc welding + Gas welding
6.	Plastic moulding, glass cutting	Casting
7.	Metal casting	Smithy
8.	Welding (arc welding & gas welding), brazing	Plastic moulding & Glass Cutting

Subject: SPORTS AND YOGA

Code: AMAU204

0 Credits | Semester 1

Total Lecture: 2 Total Period: 45

A. Introduction

- To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.

B. Course Outcomes:

- To practice Physical activities and Hatha Yoga focusing on yoga for strength, flexi- bility, and relaxation.
- To learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
- To learn breathing exercises and healthy fitness activities
- To understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
- To perform yoga movements in various combination and forms.

C. SYLLABUS

UNIT I: Introduction to Physical Education, Olympic Movement, Physical Fitness, Wellness and Lifestyle.

UNIT II: Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga, Kine- siology, Biomechanics & Sports.

UNIT III: Postures, Yoga, Yoga & Lifestyle.

UNIT IV: Training and Planning in Sports, Psychology & Sports, Doping.

UNIT V: Sports Medicine, Sports/Games

D. REFERENCES:

1. Prof. Ajmer Singh, Modern Trends and Physical Education
2. B.K.S. Iyengar, Light on Yoga".
3. Health and Physical Education – NCERT (11th and 12th Classes) Simon Monk and Duncan Amos, Make Your PCBs with EAGLE: From Schematic Designs to Finished Boards, McGraw Hill Education.