



**JAIDEV EDUCATION SOCIETY'S
J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR**

**B.TECH. FIRST YEAR (2020-21)
BRANCH: ARTIFICIAL INTELLIGENCE
BRANCH CODE: AI
SEMESTER-I**

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	HSMC	HU1T002	Introduction to Computer programming	2	0	0	20	20	60	100	2
2	BSC	MA1T001	Engineering Mathematics- I	3	1	0	20	20	60	100	4
3	BSC	AI1T005	Engineering Physics	3	1	0	20	20	60	100	4
4	ESC	AI1T006	Energy and Environment Engineering	3	0	0	20	20	60	100	3
5	HSMC	HU1L002	Introduction to Computer programming Lab	0	0	4	60	0	40	100	2
6	ESC	AI1L001	Workshop Practices	0	0	4	60	0	40	100	2
7	BSC	AI1L005	Engineering Physics Lab	0	0	2	60	0	40	100	1
8			Induction Programme	3 Weeks							
9	ESC	AI1T008	Introduction to AI and its Application	2	0	0	10	15	25	50	Audit
				13	2	10					18



**JAIDEV EDUCATION SOCIETY'S
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Course Title : Engineering Mathematics-1	Semester : I
Course Code : MAT001	Course Type : Compulsory
Pre-requisite : Basic knowledge of Mathematics	L – T – P : 3 – 1 – 0
Stream : Core subject	Credits : 4

COURSE OBJECTIVES

1. To understand the importance of Mathematics
2. To understand the application of Mathematics in engineering and in real life.
3. To investigate the key concepts of Mathematics.
4. To enable students to analyze a problem.

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe rank, Bernoulli's theorem, Taylor's and Maclaurin's theorems for functions of two variables, – Euler's Theorem for functions containing two and three variables, Lagrange's theorem
2. Illustrate the examples of ordinary differential equation, partial differential equation, matrices.
3. Solve questions related to ordinary differential equation, partial differential equation, matrices and their applications.
4. Apply the knowledge of matrices, ordinary differential equation, partial differential equation, and their applications to real world problems.
5. Interpret the results of matrices, ordinary differential equation, partial differential equation and their applications.
6. Design a method or modal on matrices, ordinary differential equation, partial differential equation.

Unit 1: Linear Algebra- Matrices

[09 Hours]

Determinants & Matrix, Inverse of Matrix by adjoint method, Inverse by partitioning method, solution of system of linear equations, Rank of Matrix, Consistency of linear system of equation

Unit 2: Ordinary Differential Equations of First Order and First Degree and Their Applications

[09 Hours]

Linear equations; Reducible to linear equations (Bernoulli's equation); Exact differential equations; Equations reducible to exact equations ; Applications to orthogonal trajectories , mechanical systems



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And electrical systems.

Unit3: Linear Differential Equations with Constant Coefficients [09 Hours]

Introductory remarks - complementary function, particular integral; Rules for finding complementary functions and particular integrals; Method of variation of parameters; Cauchy's homogeneous and Legendre's linear equations.

Unit 4: Partial Differentiation [09 Hours]

Partial derivatives of first and higher orders; Homogeneous functions – Euler's Theorem for functions containing two and three variables (with proofs); Total derivatives; Change of variables.

Unit 5: Applications of Partial differentiation [09 Hours]

Jacobians - properties; Taylor's and Maclaurin's theorems (without proofs) for functions of two variables; Maxima and minima of functions of two variables; Lagrange's method of undetermined multipliers.

Text Books

- 1) Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
- 2) Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
- 3) A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
- 4) A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
- 5) Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books

- 1) Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
- 2) A Text Book of Engineering Mathematics by Peter O'Neil, Thomson Asia Pte Ltd., Singapore.
- 3) Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata McGraw-Hill Publishing Company Ltd., New Delhi.



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Course Title : Engineering Physics	Semester : I
Course Code : AIIT005	Course Type : Compulsory
Pre-requisite : Basic knowledge of Physics	L – T – P : 3 – 1 – 0
Stream : Core subject	Credits : 4

COURSE OBJECTIVES

- 1.To provide a firm grounding in the basic physics principles and concept to resolve many Engineering and technological problems.
- 2.To understand and study the Physics principles behind the developments of Engineering materials.
- 3.To provide problem solving experience and learning of concepts through it in engineering physics, in both the classroom and the laboratory learning environment.

COURSE OUTCOMES

At the end of the course students will be able to

- 1.Acquire fundamental understanding of concepts specifically concern to semiconducting materials, Optics, Fibre optics, Ultrasonics, Dielectric Materials, Electron optics, Quantum Mechanics, Crystal structure and Nano-science, and their engineering applications.
- 2.Develop the ability to recognize the appropriate physics that applies to experiments based on the Engineering Physics.
- 3.To develop a systematic, logical approach to problem – solving that can be applied to problems in physics and to problems in general.

Unit I

Semiconductor (9 Hrs)

Introduction of semiconductor, PN junction Diode, Transistor Structure, Schematic Representation, Formation of Depletion Region, Biasing the Transistor, Circuit Configuration, Energy band diagram of an Unbiased Transistor, Transistor Action and its Characteristics, Energy band structure of a Biased Transistor, Relation between the currents in Common Bias (CB) configuration, Common Emitter (CE) Configuration, Energy Band Structure of Transistor connected in CE configuration, Current Relation in CE configuration, Transistor as an amplifier

Unit II

Digital Electronics (09 Hrs)

Number Systems & Boolean Algebra: Decimal, binary, octal, hexadecimal number system and conversion, binary weighted & nonweighted codes & code conversion, signed numbers, 1s and 2s complement codes, Logic gates (OR, AND, NOT, NAND, NOR, X-OR, X-NOR) Binary arithmetic, Binary logic functions , Boolean laws, truth tables, associative and distributive properties, De-Morgan's theorems



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Unit III

Electric Field and Magnetic Field

(09 Hrs)

Continuity equation for current densities; Modifying equation for the curl of magnetic field to satisfy continuity equation; Displacement current and magnetic field arising from time dependent electric field; Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field

Unit IV

Electron Ballistics & Electron Optics

(09 Hrs)

Lorentz force, Motion of charged particles in uniform electric and magnetic fields (parallel, perpendicular and at an acute angle), Effect of electric and magnetic fields on kinetic energy of charged particle, Crossed electric and magnetic field configurations, Velocity filter, Electrostatic and magnetostatic deflection.

Bethe's law, Electric and Magnetic focusing, Construction & working of Electrostatic lens, Devices: CRT, CRO, Block Diagram, Function & working of each block.

Unit V

Quantum Mechanics:

(09 Hrs)

Introduction to Quantum mechanics, Wave-particle duality, Wave packet, Heisenberg's uncertainty principle, Interpretation of wave function Schrödinger's time dependent and independent wave equations, Application to infinite potential well. Scattering from a potential barrier and tunneling

Text books:

1. Engineering Physics M.N. Avadhanulu and P.G. Kshirsagar. S.Chand and Company LTD.
2. Engineering Physics – Dr. L. N. Singh. Synergy Knowledgeware-Mumbai.
3. Engineering Physics - R.K. Gaur and S. L. Gupta. Dhanpat Rai Publications Pvt. Ltd.-New Delhi.
4. Fundamental of Physics - Halliday and Resnik. Willey Eastern Limited.
5. Engineering Physics-Hitendra K Malik, Ajay Kumar Singh, Tata McGraw Hill Education Private Limited, New Delhi.

Reference books:

1. Introduction to Electrodynamics –David R. Griffiths.
2. Concept of Modern Physics – Arthur Beizer. Tata McGraw-Hill Publishing Company



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Limited.

3. Optics – Ajoy Ghatak. MacGraw Hill Education (India) Pvt. Ltd.
4. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan. New Age International Pvt.Ltd.
5. Solid State Physics – A.J. Dekker. McMillan India –Limited.
6. The Feynman Lectures on Physics Vol I, II, III.
7. Introduction to solid state physics – Charles Kittel. John Willey and Sons.



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Course Title : Engineering Physics-Lab	Semester : I
Course Code : AI1L005	Course Type : Compulsory
Pre-requisite : Basics of Physics Practical	L – T – P : 0 – 0– 2
Stream :Core subject	Credits : 1

COURSE OBJECTIVE

Students will be able to

1. Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.
2. Demonstrate an ability to make physical measurements and understand the limits of precision in measurements.
3. Enhance the comprehensibility of the practical concepts and their application.
4. Apply the analytical techniques and graphical analysis to the experimental data
5. Develop the skills to identify various parts of the apparatus used in the experiment in laboratory.
6. Design and apply the practical knowledge of engineering physics in daily life

COURSE OUTCOME

Students will be able to

1. Visualize and understand the concepts of various phenomenon of light, principle of LASER, Optical fiber and electric and magnetic field.
2. Understand the working principles of Semiconducting devices and their application.
3. Apply the theoretical concepts to demonstrate the ability to measure properties of a variety of electrical and optical systems
4. Analyze the different crystal structure with the help of crystal models.
5. Construct the various devices based on optical phenomenon.



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6. Design the frame work of various electronic circuitries based on semiconducting materials.

List of Experiment

1. Newton's rings - Determination of radius of curvature of Plano convex lens / wavelength of light
2. Wedge Shaped film - Determination of thickness of thin wire
3. Laser - Determination of wavelength of He-Ne laser light
4. Magnetron Tube - Determination of 'e/m' of electron
5. Hall Effect - Determination of Hall Coefficient
6. Measurement of Band gap energy of Semiconductors
7. Study of I-V characteristics of P-N junction diode
8. Experiment on fibre optics
9. Input, output and current transfer characteristics of PNP/NPN transistor in CB and CE mode
10. Study of Cathode Ray Oscilloscope.

Course Title : Energy and Environment Engineering

Semester : I

Course Code : AIIT006

Course Type : Compulsory

Pre-requisite : Basic knowledge of Environment

L – T – P : 3 – 0 – 0

Stream : Theory subject

Credits : 3

COURSE OBJECTIVES

1. To understand the importance of Energy and Environment
2. To understand the application of energy saving tool in real life.
3. To investigate the key concepts of Energy and Environment.

COURSE OUTCOMES

At the end of the course students will be able to

- 1) Describe different kind of pollution eg. Water pollution, air pollution, soil pollution etc.



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- 2) Understand the importance of ecosystem for human beings..
- 3) Discover innovative method of power generation.
- 4) Correlate the cost of various method of power generation.
- 5) Judge the quality of air.

Unit 1

[4 hrs]

Air Pollution: Environment and Human health - Air pollution, Particulate emission: sources- effects- control measures -, air quality standards, and measurement of air pollution. Disposal of solid wastes, Bio-medical wastes effects- control measures

Unit 2

[4 hrs]

Water Pollution and Conservation: Water pollution- types of pollutants, effects- control measures, Water conservation and its methods, rainwater harvesting, methods of rainwater harvesting Surface runoff harvesting, Rooftop rainwater harvesting, Noise pollution –effects and control measures, -Thermal pollution – Soil pollution –Nuclear hazard.

Unit 3

[4 hrs]

Conventional Power Generation: Steam power station, Nuclear power plant – Gas turbine power plant- Hydro power station: Schematic arrangement, advantages and disadvantages, Thermo electric and thermionic generators, Environmental aspects for selecting the sites and locations of power plants.

Unit 4

[4 hrs]

Renewable Power Generation: Solar, Wind, Biogas and Biomass, Ocean Thermal energy conversion (OTEC), Tidal, Geothermal energy, Magneto Hydro Dynamics (MHD): Schematic arrangement, advantages and disadvantages.

Unit 5

[4 hrs]

Energy conservation: Scope for energy conservation and its benefits Energy conservation Principle – Maximum energy efficiency, Maximum cost effectiveness, Methods and techniques of energy conservation in ventilation and air conditioners, refrigerator, compressors, pumps, fans and blowers, Energy conservation in electric furnaces, ovens and boilers, lighting techniques. Triffs and economic aspects in power generation.

Reference/Text Books:



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1. A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, A Text book of Power System Engineering, Dhanpat Rai Publication.
2. Rai. G. D., Non Conventional Energy Sources, Khanna Publishers, Delhi, 2006.
3. Rao S., Parulekar B.B., Energy Technology-Non conventional, Renewable And Conventional, Khanna Publishers, Delhi, 2005.
4. Glynn Henry J., Gary W. Heinke, Environmental Science and Engineering, Pearson Education, Inc, 2004.
5. J. M. Fowler, Energy and the Environment, McGraw-Hill, 2 nd Edition, 1984.
6. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Prentice Hall, 2003.

Course Title : Introduction To Computer Programming	Semester : I
Course Code : HU1T002	Course Type : Compulsory
Pr-requisite : Basic knowledge of Computer	L – T – P : 2 – 0 – 0
Stream : Theory subject	Credits : 2

COURSE OBJECTIVES

1. To understand the importance of Programming
2. To understand the application of C Programming.
3. To investigate the key concepts of C Programming.
4. To enable students build a applications based on C programming

COURSE OUTCOMES

CO1: Define the algorithms, flowcharts, array , pointer, structure ,function , python.

CO2: Discuss and differentiate between variables , operators ,statements , loops, array dimensions.



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CO3: Demonstrate working programs using functions, loops, conditional statements, array, pointer, structure and files in C and python language.

CO4: Distinguish between different steps of programming and prioritize levels of programming.

CO5: Find errors and predict outcome in C and python programming.

CO6: Compose and develop any application using C and python programming.

Unit I

Basic of Programming Language: (6 Hrs)

HLL, LLL, Language translator, Error checking, Debugging, Programming processes, Flowcharts, Algorithms along with asymptotic notation.

Unit II

Types, Operators and Expressions in C language : (6 Hrs)

Variable names, Data types, sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Unit III

Control Flow: (6 Hrs)

Statements and Blocks. If-else, else-if, switch, Loops: while and for, do-while break and continue go to and Labels. Initializing arrays, Initializing character arrays, multidimensional arrays, Introduction to pointers.

Unit IV

Functions and Pointers in Python: (6 Hrs)

Functions and Program Structure: Basic of functions, functions returning non-integers external variables scope rules.

Pointers in Python: Pointers to integers, characters, floats, arrays.

Unit V

(6 Hrs)



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Structures in Python: Basics of structures, structures with functions, arrays of structures.

File handling in Python: Basics of file handling.

Text Books

1. Let Us C by Yashavant Kanetkar.
2. Let Us C Solutions by Yashavant Kanetkar.
3. Data Structure Through C by Yashavant Kanetkar.

Reference Books

- 1.C Programming: A Modern Approach (2nd Edition) - K. N. King (2008). A good book for learning C.
- 2.Programming in C (4th Edition) - Stephen Kochan (2014). A good general introduction and tutorial.
- 3.C Primer Plus (5th Edition) - Stephen Prata (2004)
- 4.A Book on C - Al Kelley/Ira Pohl (1998).
- 5.The C Book (Free Online) - Mike Banahan, Declan Brady, and Mark Doran (1991).



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Course Title : Introduction To Computer Programming (LAB)

Semester : I

Course Code : HU1L002

Course Type : Compulsory

Pr-requisite : Basic knowledge of Computer

L – T – P : 0 – 0– 4

Stream : Theory subject

Credits : 2



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COURSE OBJECTIVES

1. To introduce students to the basic knowledge of programming fundamentals of C language.
2. To impart writing skill of C programming to the students and solving problems.
3. To impart the concepts like looping, array, functions, pointers, file, structure

COURSE OUTCOME

After completing this lab course you will be able to:

1. Understand the logic for a given problem.
2. Write the algorithm of a given problem.
3. Draw a flow chart of a given problem.
4. Recognize and understand the syntax and construction of C programming code..
5. Make use of different data-structures like arrays, pointers, structures and files.
6. Know the alternative ways of providing solution to a given problem.

List of Pratical:-

NAME OF PRATICAL

- 1 A simple program to display a message “Hello World” on screen.
- 2 Write a Program to print addition ,subtraction Multiplication and Division of a entered number.
- 3 Write a Program to LCM of the entered number..
- 4 Write a program to find GCD of the entered number.
- 5 Write a program to find the greatest among three number.
- 6 Write a any menu driven program using if...else statement.



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- 7 Write a any menu driven program using Switch case statement.
- 8 Write a program to find count of even no ,count of odd number , sum of even no and sum of odd number between 1 to 50.
- 9 Write a Program to generate prime number up to inputted number.
- 10 Write a program to check entered no is Armstrong no or not.
- 11 Write a program to find transpose of a matrix.
- 12 Write a Program to find multiplication of a two matrix elements.
- 13 Write a Program to find length of a string.(with and without using a library function)
- 14 Write a Program to find addition of two numbers using pointer.
- 15 Open ended Program. (How to execute C program on linux optating system)
- 16 Write a Python program to print "Hello World".
- 17 Write a Python program to display the current date and time.
- 18 Write a Python program which accepts the radius of a circle from the user and compute the area.
- 19 Write a Python program to find reverse of the entered number.
- 20 Write a Python program to get the Python version you are using



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Course Title : Workshop Practices

Semester : I

Course Code : AI1L001

Course Type : Compulsory

Pre-requisite : Basic Knowledge Of Workshop

L – T – P : 0 – 0 – 4

Stream : Practical subject

Credits : 2

Instructions to the student:

Each student is required to maintain a „workshop journal“ consisting of drawing / sketches of the jobs and a brief description of tools, equipment, and procedure used for doing the job.

Contents:

a) **Carpentry:** Technical Terms related to wood working, Types of wood, Joining materials, Types of joints - Mortise and Tenon, Dovetail, Half Lap, etc., Methods of preparation and applications, Wood working lathe, safety precautions.

b) **Welding:** Arc welding - welding joints, edge preparation, welding tools and equipment, Gas welding - types of flames, tools and equipment, Resistance welding - Spot welding, joint preparation, tools and equipment, safety precautions.

c) **Fitting:** Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc., Fitting hand tools like vices, cold chisel, etc. Drilling machine and its operation.

e) **Machine shop:** Lathe machine, types of lathes, major parts, cutting tool, turning operations (Demo), safety precautions

List of Practical:



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1. Wood sizing exercises in planning, marking, sawing, chiseling and grooving to make half lap joint and cross lap joint.
2. A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding, drilling and tapping on M. S. plates.
3. Exercise in Arc welding (MMAW) to make a square butt joint.
4. A demo job on turning of a Mild Steel cylindrical job using center lathe.

Electrical workshop:-

- 1) To wire for a stair case arrangement using a two-way switch.
- 2) To measure electrical quantities-voltage current, power & power factor in RLC circuit.



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Course Title : Introduction to A I & Its Application	Semester : I
Course Code : AI1T008	Course Type : Compulsory
Pre-requisite : Basic knowledge of Mathematical Logic	L – T – P : 2 – 0 – 0
Stream : Theory subject	Credits : Audit

COURSE OBJECTIVES

1. To understand the importance of AI and use of AI tools
2. To understand the application of AI in engineering and in real life.
3. To investigate the key concepts of knowledge representation and different notations.
4. To enable students to analyze a problem so that appropriate problem solving techniques may be applied.

COURSE OUTCOMES

Upon successful completion of this course student will able :

1. To understand the basics of Artificial Intelligence , Intelligent Agents and its structure
2. To Apply various searching techniques of Problem solving
3. To Acquire theoretical knowledge about principles for logic-based representation and reasoning
4. To Participate in the design of systems that act intelligently and learn from experience
5. To Understand the relation between AI & various domains

Unit I

8 Hrs

Introduction to AI: What is AI? Foundations of AI, History of AI, Agents and environments, The nature of the Environment, Problem solving Agents, Problem Formulation, Case Study:Self Driving Car



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Unit II

8 Hrs

Artificial Intelligence Tools & Frameworks:

TensorFlow: Tensor Data Structure, Various Dimensions of TensorFlow, Tensor Handling and Manipulations, Tensors Operations: Resizing a Tensor, Mathematical Operations, Mean and Standard deviation

Keras: Keras models: Sequential Model and an advanced Model class with functional API, Advantages of Keras, Keras layers

PyTorch: PyTorch – Introduction, PyTorch – Terminologies, PyTorch - Loading Data

Unit III

Applications of AI in Healthcare :

7 Hrs

Existing healthcare system, AI Technologies used in healthcare, comparison with existing system :efficiency, advantages, challenges, Roles of AI in healthcare, Challenges, Benifites, Treatment decision AI based approach Examples

Applications of AI in Agriculture :

Scope of AI in Agriculture, Challenges in AI Adoption in Agriculture, AI Technologies used Agriculture, AI based Automation techniques in irrigation and crop monitoring, AI startups in Agriculture

Unit IV

8 Hrs

Problem Solving as Search: Structures and strategies for state space search. Algorithms for Heuristic search, Heuristic evaluation functions. Game Search, Case study

Unit V

8 Hrs

Reasoning & Knowledge Representation

Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic, Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, issues in knowledge representation, Case Study :Google Duplex

Text Books:

1. Artificial Intelligence' R B Mishra, PHI
2. Artificial Intelligence, Stuard Russell & Peter Norvig, Prentice Hall



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Reference Books:

1. Introduction to Artificial Intelligence, CHARNIAK, PEARSON
2. Problem Solving Methods, J. Siekmann, R. Goebel, and W. Wahlster, Springer, 2000 edition
3. Principles of Artificial Intelligence, N.J.Nilsson, Narosa Publications.



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B.TECH. FIRST YEAR (2020-21)

BRANCH: ARTIFICIAL INTELLIGENCE

BRANCH CODE: AI

SEMESTER-II

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	HSMC	HU2T001	Communication Skills	2	0	0	60	0	40	100	2
2	BSC	MA2T001	Engineering Mathematics- II	3	1	0	20	20	60	100	4
3	BSC	AI2T002	Engineering Chemistry	3	1	0	20	20	60	100	4
4	ESC	AI2T003	Engineering Graphics	1	0	0	20	20	60	100	1
5	HSMC	HU2L001	Communication Skills Lab.	0	0	4	60	0	40	100	2
6	BSC	AI2L002	Engineering Chemistry Lab	0	0	2	60	0	40	100	1
7	ESC	AI2L003	Engineering Graphics Lab	0	0	4	60	0	40	100	2
8			Societal Internship/ Field Training	Report submission						50	1
9	ESC	AI2T009	Introduction to Drones	2	0	0	10	15	25	50	Audit
				11	2	10					17
				23							



**JAIDEV EDUCATION SOCIETY'S
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Course Title : Engineering Mathematics-II	Semester : II
Course Code : MA2T001	Course Type : Compulsory
Pre-requisite : Basic knowledge of Mathematics	L – T – P : 3 – 1– 0
Stream :Core subject	Credits : 4

COURSE OBJECTIVES

1. To understand the importance of Mathematics
2. To understand the application of Mathematics in engineering and in real life.
3. To investigate the key concepts of Mathematics.
4. To enable students to analyze a problem

Unit 1: Complex Numbers [09 Hours]

Definition and geometrical representation ; De-Moivre's theorem(without proof) ; Roots of complex numbers by using De-Moivre's theorem ; Circular functions of complex variable – definition ; Hyperbolic functions ; Relations between circular and hyperbolic functions ; Real and imaginary parts of circular and hyperbolic functions ; Logarithm of Complex quantities.

Unit 2: Integral calculus & Multiple Integrals [09 Hours]

Beta, Gamma functions; Tracing of the curves given in Cartesian, parametric & polar forms.

Double integration in Cartesian and polar co-ordinates; Evaluation of double integrals by changing the order of integration and changing to polar form; Triple integral

Unit3:Fourier Series& Transform [09 Hours]

Fourier Series , Definition and Properties (excluding FFT), Fourier Integral Theorem, Relation with Laplace Transform, Applications of Fourier Transform to Solve Integral Equations.

Unit4:Vector Differential Calculus [09 Hours]

General rules of vector Differentiation; Scalar and vector fields: Gradient , divergence and curl ;



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Solenoidal and irrotational vector fields; Vector identities .

Unit5: Vector Integral Calculus

[09 Hours]

Vector Integration : line integral , surface integral and volume integral ; Green's lemma , Gauss' divergence theorem and Stokes' theorem (without proofs).

Text Books

- 1) Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
- 2) Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
- 3) A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledge, Mumbai.
- 4) A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
- 5) Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books

- 1) Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
- 2) A Text Book of Engineering Mathematics by Peter O'Neil, Thomson Asia Pte Ltd. , Singapore.
- 3) Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe concept of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus.
2. Illustrate the concept of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus by using examples.
3. Apply the knowledge of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.
4. Analyze the problems and results of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.
5. Evaluate the problems by using complex numbers, integral calculus & multiple integrals, Fourier series &



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transform, vector differential calculus, vector integral calculus to solve the engineering problems.

6. Create the methods or model by using complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.



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Course Title : Engineering Chemistry	Semester : II
Course Code : AI2T002	Course Type : Compulsory
Pre-requisite : Basic knowledge of Chemistry	L – T – P : 3 – 1– 0
Stream :Core subject	Credits : 4

COURSE OBJECTIVES

1. To understand the importance of Chemistry
2. To understand the application of Chemistry in engineering and in real life.
3. To investigate the key concepts of Chemistry knowledge
4. To enable students to analyze a Chemistry problem so that appropriate problem solving techniques may be applied.

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe various properties of water, nanomaterial, transition metal ions and their magnetic properties, Debye-Hückel theory, Quinonoid theory, various electrode, spectrophotometric techniques .
2. Illustrate the various types of water, carbon nanotubes, Molecular orbital theory, Transport number by Moving Boundary method, Ostwald's theory of acid-base indicator, various batteries, UV and NMR spectroscopy.
3. Analyze the question on water characteristics, electrochemistry and various types of instrumental titration, various unknown sample by UV and NMR spectroscopy .
4. Apply the Knowledge of zeolite process, Ion exchange process, Hot Lime –Soda process, acid base concept, spectroscopic techniques.
5. Develop a Model on softening of water, standardization of acid and base by various instruments, doping on band structure, spectroscopic techniques.
6. Organize water as per quality, carbon nanotubes, electrodes, Energy level diagrams of diatomic molecules, various elements as per their spectroscopic techniques.

Unit-1 [9 Hr]

Water Conditioning: Specifications of water for industries (paper, textile, beverages and power generation), types of hardness; softening of water by lime-soda process, Zeolite process, De-mineralization process (principle, advantages and limitations). Numerical based on lime-soda and Zeolite process. Boiler troubles, sequestration (carbonate, phosphate and calgon), Treatment of waste water.



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Unit-2

6 hrs

Nanomaterials: General introduction to nanotechnology, timeline and milestone, overview of different nanomaterials available, potential use of nanomaterials in electronics, sensors, catalysis, environment and cosmetics. Synthesis of nanomaterials: 'Top-Down'- photolithography and 'Bottom-Up'- sol-gel method. Carbon nanotubes: single-walled and multi-walled carbon nanotubes, their structures, properties and applications. Potential risks of nanomaterials- environmental impact.

Unit-3

8 hrs

Atomic and molecular structure: Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbital. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structure.

Unit-4

8 hrs

Periodic properties: Effective nuclear charge, penetration of orbital's, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

Unit-5

6 hrs

Spectroscopic techniques and applications (UV and NMR):

Part A) Ultraviolet Spectroscopy: Principles of spectroscopy and selection rules. Ultraviolet spectroscopy and its application. Fluorescence and its applications in medicine.

Part B) NMR Spectroscopy: Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques.

Text Books:

1. A Text book of Engineering Chemistry, Dr. S. S. Dara, Dr. S. S. Umre, S. Chand and Company Ltd., Twelfth/ 2011
2. Selected Topics in Inorganic Chemistry, Dr. Wahid U. Malik, Dr. G. D. Tuli and Dr. R. D. Madan, S. Chand and Company Ltd., Seventh/2001



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Reference Books:

1. Engineering Chemistry, P. C. Jain And Monika Jain, Dhanpatrai Publishing Company Ltd., 15th Ed/ 2009
2. Principles of Physical Chemistry, B. R. Puri, L. R. Sharma and Madan S. Pathania, Vishal Publishing Company, First/2002
3. Chemistry, John E McMurry and Robert C Fay, Pearson, First/2008



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Course Title : Engineering Chemistry Practical	Semester : II
Course Code : AI2L002	Course Type : Compulsory
Pre-requisite : Basic knowledge of Chemistry	L – T – P : 0 – 0 – 2
Stream : Theory subject	Credits : 1

COURSE OBJECTIVES

Students will be able to

1. Students will explore new areas of research in both chemistry and allied fields of science and technology.
2. Students will understand safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
3. Students will recognize common laboratory techniques including pH measurement, acid/base titrations, UV/Visible spectroscopy.

COURSE OUTCOMES

Students will be able to

1. Recall hardness of water, acid value, saponification number of oils.
2. Demonstrate an ability to make chemical measurements and understand the limits of precision in measurements.
3. Enhance the comprehensibility of the practical concepts and their application.
4. Apply the analytical techniques to the experimental data
5. Making judgments based on criteria and standards through checking and critiquing
6. Design and apply the practical knowledge of engineering chemistry in daily life

List of Experiments: (Perform any 8– 10 Experiments)

1. Determination of Hardness of water sample by EDTA method.
2. Determination of flash point by Pensky Martin Apparatus
3. Determination of Dissolve Oxygen by Iodometric method.
4. Determination of percent purity of Bleaching Powder.
5. pH – metric Titration (any one type of Acid Base titration)
6. Conductometric Titration (any one type of Acid Base titration)
7. Surface tension: Determination of relative surface tension of liquid with respect to water using drop number method.
8. Viscosity: Determination of relative viscosity of liquid with respect to water using Ostwald's viscometer method.



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9. To determine the normality in Normal term and Strength in gms/lit of HCl solution by titrating with Na_2CO_3 solution.
10. To find out Normality, Normality and Strength of the given KMnO_4 solution by titrating against N/10 Mohr's solution.
11. Determination of Acid value of an oil sample.
12. Determination of Saponification value of an oil sample.



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Course Code : AI2T003

Course Type : Compulsory

Pre-requisite : Basic knowledge of Graphics

L – T – P : 1 – 0 – 0

Stream : Practical subject

Credits : 1

COURSE OBJECTIVES

1. To understand the concepts like dimensioning, conventions and standards related to engineering graphics in order to become professionally efficient
2. To understand theory of projection and simple machine parts in first and third angle of projection systems.
3. To understand the key concepts CAD software.
4. To enable students to analyze a 2-dimensional & 3-dimensional problem.

COURSE OUTCOMES

1. Define various concepts like dimensioning, conventions and standards related to engineering graphics in order to become professionally efficient.
2. Interpret drawings of simple machine component in first and third angle of projection systems
3. Apply theory of projections in projection of lines, projection of planes and projection of solid.
4. Classify solid geometry in different positions.
5. Assess the two dimensional and three dimensional drawing in CAD software.
6. Create the three dimensional engineering objects into two dimensional drawings and vice versa using CAD software

Unit I Introduction to Computer Aided Drawing

[03 hrs]

Theory of CAD software, Demonstration knowledge, layout of the software, standard tool bar/menus and description of most commonly used tools bars, Navigational tools. Creation of 2D/3D environment. Commands and creation of co-ordinate points, lines, axes, polyline, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, offset, mirror, rotate, trim, extend, break, chamfer, fillet, zoom, pan, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, lettering. Line properties, 3D modeling & topology of engineering component.

Unit II Drawing standards & Orthographic Projections:

[03 hrs]

Drawing standard SP: 46, type of lines, lettering, dimensioning. Basic geometrical construction, drawing of regular polygon, Theory of projection, introduction to orthographic projection, drawing of orthographic views of objects from their isometric views by using first angle method of projection.

Unit III Projections of Points & Projections of Straight Lines:

[03 hrs]

Projection of point lying in four quadrants. Projections of lines parallel and perpendicular to one or both



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planes, projections of lines inclined to one or both reference planes.

Unit IV Projections of Planes & Projections of Solids:

[03 hrs]

Projections of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes.

Types of solids, Projection of solid when axis is perpendicular to one of the reference planes, when axis is inclined to one and parallel to other reference plane, when axis is inclined to both the reference planes

Unit V Isometric Projections

[03 hrs]

Isometric projections: Isometric scale, drawing of isometric projections from given orthographic views.

Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 46th Edition, 2003.
2. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to AutoCAD, McGraw Hill Education, 2017

Reference Books:

1. K. V. Natarajan, A text book of Engineering Graphic, Dhanalakshmi Publishers, Chennai, 2006.
2. K. Venugopal and V. Prabhu Raja, Engineering Graphics, New Age International (P) Ltd, 2008.
3. Engineering Drawing, R. K. Dhawan, S. Chand Publication, 1998.
4. Engineering Graphics, A. R. Bapat, Allied Publishers, 2004.
5. Fundamentals of Engineering Drawing, Luzadder & Duff, Eastern Economy, 11th Edition.



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Course Title : Engineering Graphics-Lab	Semester : II
Course Code : AI2L003	Course Type : Compulsory
Pre-requisite : Basics of Graphics Lab	L – T – P : 0 – 0– 4
Stream : Practical subject	Credits : 2

COURSE OBJECTIVES:

The objective of the course is to enable students to

1. Provide basic foundation in CAD software.
2. Understand the fundamentals used to create and manipulate geometric models.
3. Get acquainted with the basic CAD software for to design geometric modeling.

COURSE OUTCOMES:

1. Define basic structure of CAD workstation, CAD commands, Memory types, input/output devices and display devices to become professionally efficient to operate CAD software.
2. Explain drawing of simple machine component in CAD software.
3. Acquire the knowledge of geometric modeling in CAD software.
4. Analyze the steps required in CAD software for 2-dimensional and 3-dimensional models.
5. Assess the two dimensional and three dimensional drawing in CAD software.
6. Create the three dimensional engineering objects into two dimensional drawings and vice versa using CAD software.

List of Practical :

1. Introduction of CAD software and to study and practice basic draw commands exists in the CAD software.
2. Lines, lettering and dimensioning. (Drafting work)
Identify the different types of Lines in the given object, draw lettering and give the Required dimensions in the given object.
3. Geometric Construction. (Drafting work)
4. Orthographic projections first sheet. (Using CAD software)
5. Orthographic projections second sheet. (Using CAD software)
6. Projections of straight lines. (Drafting work)



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7. Projections of planes & solids. (Drafting work)
8. Isometric Projections first sheet. (Using CAD software)
9. Isometric Projections second sheet. (Using CAD software)
10. Design of basic hardware components using CAD Software.
11. Design of advance hardware components using CAD Software.
12. Design of assembly drawing using CAD Software.
13. Design of assembly drawing with animation and rendering using CAD Software.



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Course Title : Communication Skills	Semester : II
Course Code : HU2T001	Course Type : Compulsory
Pre-requisite : Basic knowledge of English	L – T – P : 2 – 0 – 0
Stream : Theory subject	Credits : 2

Course Objectives:

The main objective of the subject is to enhance the employability skills of engineering students as well as communication skills at work place.

The sub-objectives are:

- 1) To develop students' reading skills and pronunciation.
- 2) To develop technical communication skills through drafting, letter writing, and précis writing.
- 3) To develop literary skills through essay writing.
- 4) To develop public speaking skills of the students.

Course Outcomes:

At the end of the course students will be able to

- 1) to better reading comprehension, pronunciation, and functional English grammar.
- 2) to write letters and resumes
- 3) to organize their thoughts for effective presentation and writing.
- 4) to learn skills to present themselves well in an interview, and handle a Group Discussion

To expose the students to the ethics of English language by teaching grammar

Unit 1: Communication and Communication Processes (06 hrs)

Introduction to Communication, Types and functions of Communication, Barriers to Communication and overcoming them, Role of Communication Skills in Society

Reading: Introduction to Reading, Barriers to Reading, Types of Reading: Skimming, Scanning, Intensive and Extensive, Strategies for Reading Comprehension.

Listening : Importance of Listening, Types of Listening, Barriers to Listening.

Unit 2: Study of Sounds in English and Vocabulary Building (06 hrs)

Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation of



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Different Sounds in English.

Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Use of prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations

Unit 3: English Grammar

(06 hrs)

Grammar: Forms of Tenses, Articles, Prepositions, Use of Auxiliaries and Modal Auxiliaries, Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation,

Common Errors. Misplaced modifiers

Unit 4: Professional Verbal Communication

(06 hrs)

Components of an effective talk, Idea of space and time in public speaking, Tone of voice, Body language, Timing and duration of speech, Audio-Visual Aids in speech. Presentation Skills, Group Discussion and Job Interviews

Unit 5: Developing Business Writing Skills, Styles and Practice

(06 hrs)

Writing Emails, Report Writing: Format, Structure and Types, Letter Writing: Types, Parts, Layouts, Writing Job Application Letter and Resume.

Nature and Style of sensible Writing and Practice: Describing, Defining, Classifying, Providing examples or evidence, writing introduction and conclusion, Writing Practices: Comprehension, Précis Writing, Essay Writing

Text book:

Mohd. Ashraf Rizvi, Communication Skills for Engineers, Tata McGraw Hill

Reference Books:

- 1) Sanjay Kumar, Pushp Lata, Communication Skills, Oxford University Press, 2016
- 2) Meenakshi Raman, Sangeeta Sharma, Communication Skills, Oxford University Press, 2017
- 3) Teri Kwal Gamble, Michael Gamble, Communication Works, Tata McGraw Hill Education,



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2010

- 4) Anderson, Kenneth. Joan Maclean and Tossny Lynch. Study Speaking: A Course in Spoken English for Academic Purposes. Cambridge: CUP, 2004.
- 5) Aswalthapa, K. Organisational Behaviour, Himalayan Publication, Mumbai (1991).
- 6) Atreya N and Guha, Effective Credit Management, MMC School of Management, Mumbai (1994).
- 7) Balan, K.R. and Rayudu C.S., Effective Communication, Beacon New Delhi (1996).
- 8) Bellare, Nirmala. Reading Strategies. Vols. 1 and 2. New Delhi. Oxford University Press, 1998.
- 9) Bhasker, W. W. S & Prabhu, N. S.: English through Reading, Vols. 1 and 2. Macmillan, 1975.
- 10) Black, Sam. Practical Public Relations, E.L.B.S. London (1972).
- 11) Blass, Laurie, Kathy Block and Hannah Friesan. Creating Meaning. Oxford: OUP, 2007.
- 12) Bovee Courtland, L and Thrill, John V. Business Communication, Today McGraw Hill, New York, Taxman Publication (1989).



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Course Title : Communication Skills-Lab	Semester : II
Course Code : HU2L001	Course Type : Compulsory
Pre-requisite : Basics of English grammar	L – T – P : 0 – 0– 4
Stream : Theory subject	Credits : 2

COURSE OBJECTIVES:

1. Apply appropriate communication skills. Students are able to enhance their employability skills as well as communication skills at work place.
2. Demonstrate knowledge of communication theory and application. Students have better reading comprehension, pronunciation, and functional English grammar.
3. Practice critical thinking to develop innovative and well-founded perspectives related to the students' emphases.
4. Build and maintain healthy and effective relationships. Students are able to write letters and resumes.
5. Use technology to communicate effectively in various settings and contexts. Students are able to organize their thoughts for effective presentation and writing.
6. Demonstrate appropriate and professional ethical behavior. Students are able to learn skills to present themselves well in an interview, and handle a Group Discussion

COURSE OUTCOMES

Students will be able to

CO1. Remember Communication Skills by giving adequate exposure in reading, writing, listening and speaking.

CO2. Understand the communication process by identifying, explaining, and applying current communication theories as they relate to a variety of contexts.

CO3. Apply proficiency, both in spoken and written English.

CO4. Analysing the communication behaviours of others and themselves in a variety of scenario (e.g. interpersonal, intercultural, group, public and professional communication, and mass media).



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CO5. Evaluate and organize their thoughts for effective presentation and writing.

CO6. Improve research, organizational, and critical thinking skills by finding and evaluating reference material and organizing and presenting effective messages adapted to specific situations.

List of Practical Sessions (Any 10 PR sessions can be conducted):

- 1) Pronunciation, Intonation, Stress and Rhythm(02 hrs)
- 2) Introduction to Phonemic symbols (02 hrs)
- 3) Articulation of sounds in English with proper manner (02 hrs)
- 4) Practice and exercises on articulation of sounds (02 hrs)
- 5) Read Pronunciations/transcriptions from the dictionary (02 hrs)
- 6) Practice and exercises on pronunciations of words (02 hrs)
- 7) Introduce yourself (02 hrs)
- 8) Importance of Business Communication with the help of a case study.(02hrs)
- 9) Listening Skills/ Comprehension(02 hrs)
- 10) Common Everyday Situations: Conversations and Dialogues(02 hrs)
- 11) Communication at Workplace(02 hrs)
- 12) Rapid reading sessions (02 hrs)
- 13) Draft Email(02 hrs)
- 14) Resume Writing(02hrs)
- 15) Drafting Business Letter(02 hrs)
- 16) Preparing technical paper using IEEE format(02 hrs)
- 17) Extempore (02 hrs)
- 18) Elocution (02 hrs)
- 19) Group discussion (02 hrs)
- 20) Participating in a debate (02 hrs)
- 21) Presentation techniques (02 hrs)
- 22) Interview techniques – Job Interviews, Telephonic Interviews(02hrs)
- 23) Mock interviews and practice sessions(02 hrs)



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Course Title :	Introduction to Drones	Semester :	II
Course Code :	AI2T009	Course Type :	Compulsory
Pre-requisite :	Nil	L – T – P :	2 – 0 – 0
Stream :	Theory subject	Credits :	Audit

Course Objectives

The main aim of this course is to understand the basics of Drones and its various applications. The course will also impart the knowledge of how to fly a drone by considering the rules and regulations to the specific country. Further the students will be introduced to the safety measures to be taken during flight.

Course Outcomes:

Student will be able to

CO1: To introduce the various types of frame design used for the UAV and to accommodate the electronics over the frame to fly UAV.

CO2: To make the students understand the basic working principal behind the electronic components used and its specification to build a drone from scratch.

CO3: To enable the students to identify and understand various functional modules of the controller using a preprogrammed controller used in the UAV.

Unit I

Introduction to Drone Technology: Types of Drones and Their Technical Characteristics, Main Existing Drone Types, Level of Autonomy, Size and Weight, Differences in Energy Source, Widely Used Drone models, Future Developments in Drone Technology.

Unit II

A systems view of drones and the types of hardware and software used for data collection, storage, and analytical requirements(sensors, platforms, navigation, power source, command and control, range, altitude, speed, wide area surveillance).

Unit III

Semi-autonomous and autonomous systems that will enable communications relay, crop sensing and coordinated swarms in support of emergency response mission.



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Systems life cycle with needs assessment, goals/ objectives, requirements, testing and training, data analytics, and mission compliance.

Unit IV

Communication Links, How to Fly a Drone, Drone part design using 3D Printer, Flying Projects.

How to Build a Drone, Examination of commercial off-the-shelf (COTS) and commercial research and development (R&D) technologies.

Textbook/References:

1. Syed Omar Faruk Towaha, Building Smart Drones with ESP8266 and Arduino: Build exciting drones by leveraging the capabilities of Arduino and ESP8266, Packt Publishing, 2018.
2. David McGriffy, "Make: Drones: Teach an Arduino to Fly Kindle Edition", published by Make Community, 2016