



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

**B.Tech. First Year (2020-21)
Branch: Artificial Intelligence
SEMESTER-I**

Course Title : Engineering Mathematics-1	Semester : I
Course Code : AIIT001	Course Type : Compulsory
Pre-requisite : Basic knowledge of Mathematics	L – T – P : 3 – 1– 0
Stream :Core	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: 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 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 linearequations.

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.



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

- 3) Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., NewDelhi.

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 model on matrices, ordinary differential equation, partial differential equation.

Course Title : Engineering Chemistry
Course Code : AIIT002
Pre-requisite : Basic knowledge of Chemistry
Stream : Core

Semester : I
Course Type : Compulsory
L – T – P : 3 – 1 – 0
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

Unit-1

6 hrs

Water Treatment: Introduction, hard and soft water, softening of water – Zeolite process, Ion exchange process, Hot Lime – Soda process, water characteristics- Hardness, Domestic treatment of water

Unit-2

6 hrs

Nanomaterials: Definition of nanomaterials, nano scale. Carbon nano tubes: Different types of CNT; applications of nanomaterials in medicine, environment and electronics. Threats of Nanomaterials.

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.



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

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

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

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.



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JD COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR**

Course Title : Introduction to A I & Its Application	Semester : I
Course Code : AIIT003	Course Type : Compulsory
Pre-requisite : Basic knowledge of Mathematical Logic	L – T – P : 3 – 1 – 0
Stream : Core	Credits : 4

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

[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

[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, Benefits, 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, Stuart Russell & Peter Norvig, Prentice Hall

Reference Books:

1. Introduction to Artificial Intelligence, CHARNIAK, PEARSON



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J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR**

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

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

Course Title : Energy and Environment Engineering	Semester : I
Course Code : AIIT004	Course Type : Compulsory
Pre-requisite : Basic knowledge of Environment	L – T – P : 2 – 0 – 0
Stream :HSMC	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

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:

1. A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, A Text book of Power System



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

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 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.
- 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.

Course Title : Workshop Practices

Course Code : AIIL005

Pre-requisite : Basic Knowledge Of Workshop

Stream :Core

Semester : I

Course Type : Compulsory

L – T – P :0 – 0– 4

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:

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.



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

Course Title : Basic Electrical and Electronics Engineering	Semester : I
Course Code : AI1T006	Course Type : Audit
Pre-requisite : Basic knowledge of Electrical and Electronics	L – T – P : 2 – 0 – 0
Stream : Core	Credits : 0

Unit 1 **(6 Lectures)**

Elementary Electrical Concepts and CIRCUIT COMPONENTS

Fundamental of Electrical system: Potential difference, Ohm's law, Effect of temperature on resistor, resistance temperature coefficient, **Electrical wiring system:** Study of different wire gauges and their applications in domestic and industry. **Resistors:** color code, type of resistors, material used for resistors, resistance wires, resistance standards, frequency errors in resistors. **Capacitors:** Capacitance standards, variable capacitors, frequency errors in capacitors. Loss angle and power factor of capacitors. **Inductors:** standards of inductance, mutual inductance, self-inductance, variable inductance, inductors for high and low frequency work, frequency errors in inductors.

Unit 2 **(6 Lectures)**

Measurement Of Electrical Quantities, Measuring Instruments & Energy Resources

Measurement of Voltage, Current, and Power (1ph and 3ph), Introduction to PMMC instrument, Ohmmeter, galvanometer, potentiometers, power factor meter and frequency meters. Study of circuit breakers & Actuators (MCB & Fuse, Power Contactors & Aux contactors, Electro-Mechanical & Solid state Relays). **Energy Resources and Utilization:** Conventional and nonconventional energy resources; Introduction to electrical energy generation from different resources, transmission, distribution and utilization, Concept of Supply Demand, Power Factor, Need of unity factor.

Unit 3 **(6 Lectures)**

Introduction to diodes, diode circuit and Transducers

The P-N Junction Diode, V-I characteristics, Diode as Rectifier, specifications of Rectifier Diodes, Half Wave, Full wave, Bridge rectifiers, Equations for IDC VDC VRMS, IRMS, Efficiency and Ripple Factor for each configuration. Zener Diode, Characteristics, Specifications, Zener Voltage Regulator, Types of Diodes: LED, Photodiode. Introduction to transducer, Classification of transducers, characteristics and choice of transducers.

Unit 4 **(6 Lectures)**

Semiconductor Devices and Applications:

Transistors: Introduction, Classification, CE, CB, and CC configurations, α , β , concept of gain and bandwidth. Operation of **BJT** in cut-off, saturation and active regions (DC analysis). BJT as an amplifier, biasing techniques of BJT, BJT as a switch.

Introduction to Digital Electronics: Number System, Basic logic Gates, Universal Gates, Boolean Postulates, De-Morgan Theorems

Course Title : Introduction to AI and its Application –Lab	Semester : I
Course Code : AI1L007	Course Type : Compulsory
Pre-requisite : Basics of programming Logic	L – T – P : 0 – 0 – 2
Stream : Core	Credits : 1

List of Experiments

- (a). Write a python program to print the multiplication table for the given number?
(b). Write a python program to check whether the given number is prime or not?
(c) Write a python program to find factorial of the given number?
- Write a python program to implement simple Chatbot?
- (a) Write a python program to implement List operations (Nested List, Length, Concatenation, Membership, Iteration, Indexing and Slicing)
(b) Write a python program to implement List methods (Add, Append, Extend & Delete).
- (a). Write a python program to Illustrate Different Set Operations?



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

- (b). Write a python program to generate Calendar for the given month and year?
(c). Write a python program to implement Simple Calculator program?
5. (a). Write a python program to Add Two Matrices.
(b). Write a python program to Transpose a Matrix.
6. Write a python program to implement Breadth First Search Traversal?
7. (a) Write a python program to remove punctuations from the given string?
(b) Write a python program to sort the sentence in alphabetical order?
8. Write a program to implement Tic-Tac-Toe game using python.

Text Books :

Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016

Reference Book:

Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010

Course Outcomes

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

1. Explain basic principles of Python programming language
2. Implement chatbot for Artificial Intelligence
3. Acquire the knowledge of List operations, ListMethods, set operations

Course Title : Engineering Chemistry-Lab

Course Code : AI1L008

Pre-requisite : Basics of Chemistry Practicals

Stream :Core

Semester : I

Course Type : Compulsory

L – T – P : 0 – 0 – 2

Credits : 1

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.
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.

Reference Books:

1. Systematic experiments in Chemistry, A. Sethi, New Age International Publication, New Delhi.
2. Practical Inorganic Chemistry, A. I. Vogel, ELBS Pub.
3. Practical in Engineering Chemistry, S. S. Dara.



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

SEMESTER-II

Course Title : Engineering Mathematics-II
Course Code : AI2T001
Pre-requisite : Basic knowledge of Mathematics
Stream : Core

Semester : II
Course Type : Compulsory
L – T – P : 3 – 1 – 0
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 ; 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 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.



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

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 & 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.

Course Title : Engineering Physics
Course Code : AI2T002
Pre-requisite : Basic knowledge of Physics
Stream : Core

Semester : II
Course Type : Compulsory
L – T – P : 3 – 0 – 0
Credits : 3

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.

Unit I

LASER and Fibre Optics:

(09 Hrs)

Interaction of radiation with matter, population Inversion and Optical resonance cavity, Three and four level laser, Types of LASER – Ruby and He-Ne laser, Applications of LASER
Introduction to optical fiber, types of optical fiber, acceptance angle, acceptance cone, numerical aperture, applications.

Unit II

Semiconducting materials:

(9 Hrs)

Energy bands in solids, Intrinsic and extrinsic semiconductors, P-type and N-type semiconductor, P-N junction diode, I-V characteristics in forward and reverse bias, Rectifiers, Zener diode as a voltage regulator, Transistor action and its characteristics, Transistor as an amplifier (CE mode), Transistor as a switch and Logic gates (OR, AND, NOT, NAND, NOR, X-OR, X-NOR)

Unit III

Electron Ballistics

(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.



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

Unit IV

Quantum Mechanics:

(09 Hrs)

Motion of a charged particle in uniform electric and magnetic field, Cross field configuration, Measurement of 'e/m' by Thomson's method, Bainbridge mass spectrograph.

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.

Unit V

Crystal Structure and Nanoscience

(09 Hrs)

Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices, Interplaner spacing for cubic system, Bragg's law of X-ray diffraction.

Introduction to nanoscience and nanotechnology, Classification of nano materials, Application of nanomaterials in engineering

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.M. Srivastava, C. Srinivasan, "Science of Engineering Materials and Carbon Nanotubes", New Age International Publication, 3rd edition, 2010.
- 6.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 Limited.
3. Optics – AjoyGhatak.MacGraw Hill Education (India) Pvt. Ltd.
4. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan. New Age International Pvt.Ltd.

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.

Course Title : Engineering Graphics
Course Code : AI2T002
Pre-requisite : Basic knowledge of Graphics
Stream :Core

Semester : II
Course Type : Compulsory
L – T – P : 3 – 0 – 0
Credits : 3

COURSE OBJECTIVES

1. To understand the importance of Graphics
2. To understand the actual application of Graphics in engineering.
3. To investigate the key concepts of Graphics.
4. To enable students to analyze a problem



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

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 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.

Course Title :	Introduction to Drones	Semester :	II
Course Code :	AI2T004	Course Type :	Compulsory
Pre-requisite :	Nil	L – T – P :	2 – 0 – 0
Stream :	Core	Credits :	2

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:

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.

Course Contents:

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.



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J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR**

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.

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.

Course Title : Communication Skills
Course Code : AI2T005
Pre-requisite : Basic knowledge of English
Stream : HSME

Semester : II
Course Type : Compulsory
L – T – P : 3 – 0 – 0
Credits : 3

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.
- 5) To expose the students to the ethics of English language by teaching grammar

Unit 1: Communication and Communication Processes

(06hrs)

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

(06hrs)

Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation of Different Sounds in English.



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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 (06hrs)

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 (06hrs)

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, 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).

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



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Course Title : Engineering Physics-Lab
Course Code : AI2L006
Pre-requisite : Basics of Chemistry Practicals
Stream :Core

Semester : II
Course Type : Compulsory
L – T – P : 0 – 0– 2
Credits : 1

Exp. No.	Name of experiment
1	Hall Effect - Determination of Hall Coefficient.
2	Measurement of Band gap energy.
3	Study of I-V characteristics of P-N junction diode.
4	Experiment on Fibre Optics.
5	Newton's rings - Determination of radius of curvature of Plano convex lens.
6	Wedge Shaped film - Determination of thickness of thin wire.
7	Laser - Determination of wavelength of He-Ne laser light.
8	Magnetron Tube - Determination of 'e/m' of electron.
9	Crystal Plane – Study of planes with the help of models related Miller Indices
10	Four Probe Method - Determination of resistivity of semiconductor

Course Title : Engineering Graphics-Lab
Course Code : AI2L007
Pre-requisite : Basics of Graphics Lab
Stream :Core

Semester : II
Course Type : Compulsory
L – T – P : 0 – 0– 2
Credits : 1

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)
7. Projections of planes & solids. (Drafting work)
8. Isometric Projections first sheet. (Using CAD software)
9. Isometric Projections second sheet. (Using CAD software)



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Course Title : Communication Skills-Lab	Semester : II
Course Code : AI2L008	Course Type : Compulsory
Pre-requisite : Basics of English grammar	L – T – P : 0 – 0 – 2
Stream :HSMC	Credits : 1

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)